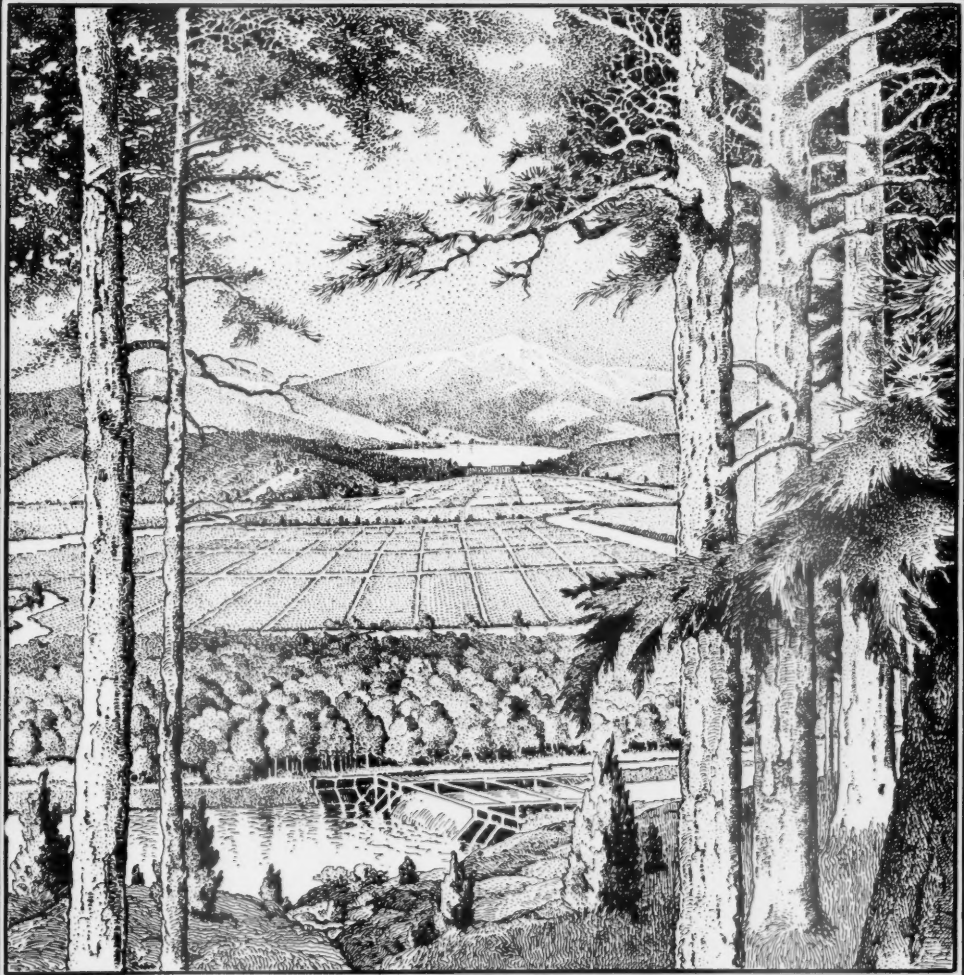


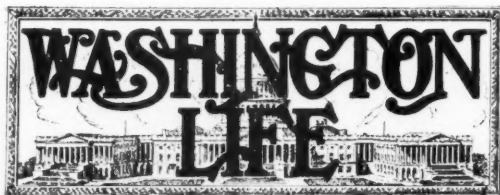
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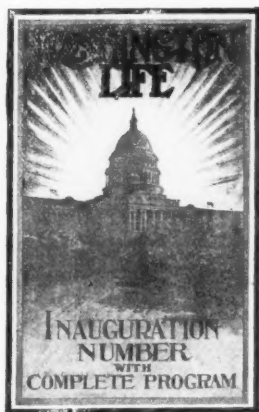
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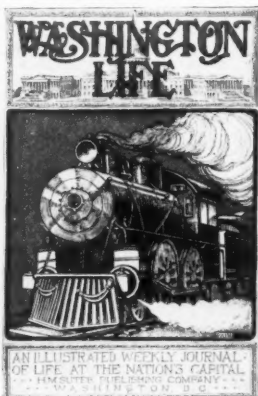
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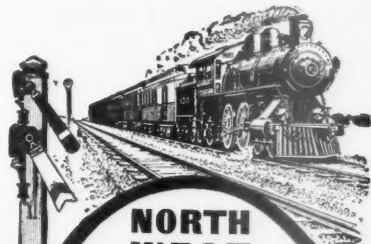
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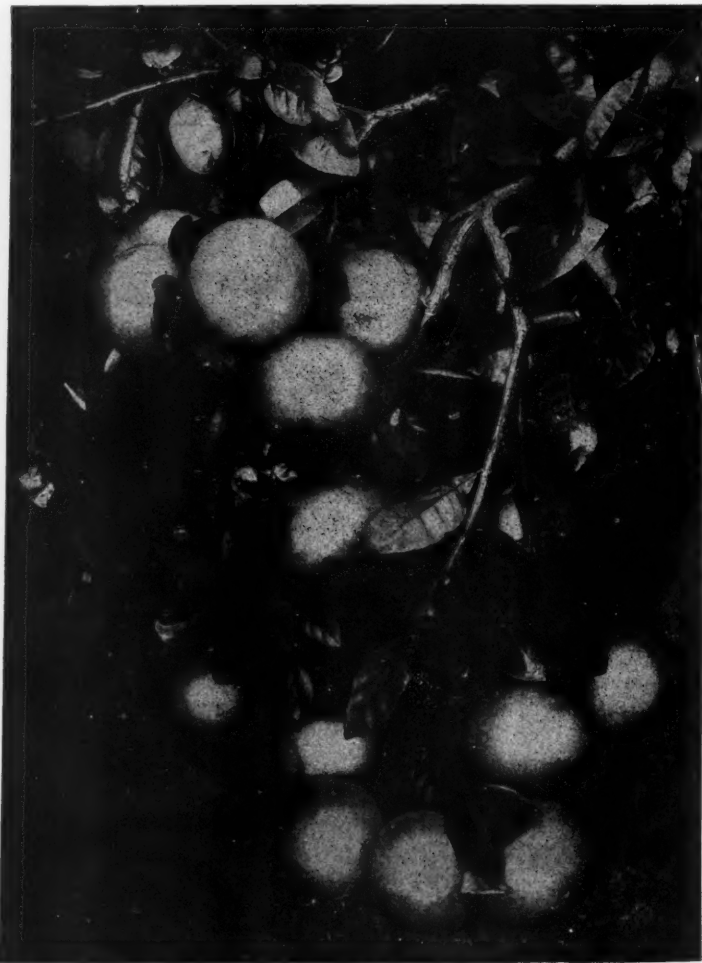
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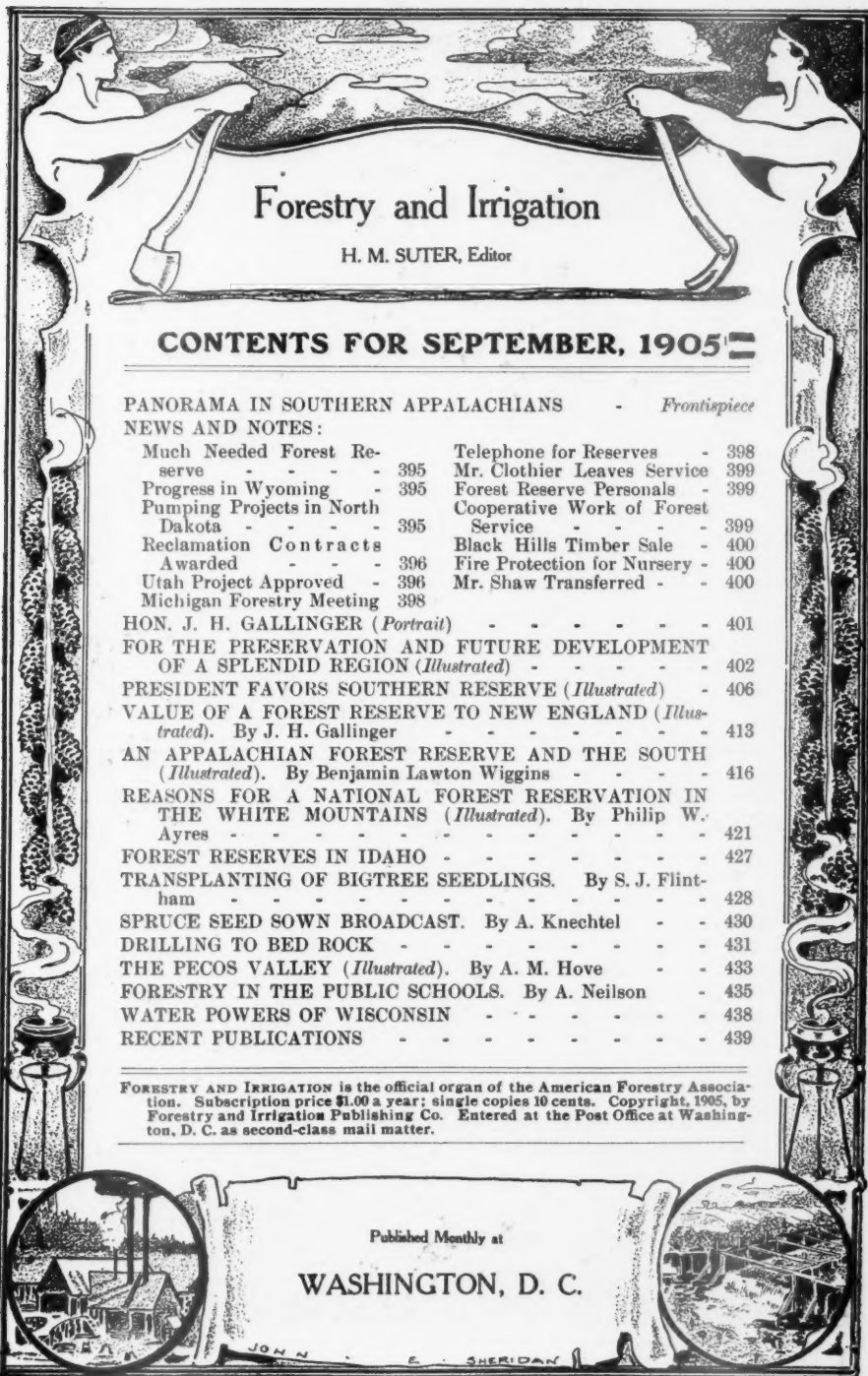
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JOHN E. SHERIDAN

Pinnacle.

Mount Mitchell (6,711 feet).

Potato Knob. Mount Gibbs
(6,591 feet.)



Panorama of the Blue Ridge, Mount Mitchell, and Southern end of the Black Mountains, the center of the proposed Southern Appalachian Forest Reserve.

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NEWS AND NOTES

Much Needed Forest Reserves Every reader of FORESTRY AND IRRIGATION is earnestly requested to

weigh well the reasons advanced in this number for the establishment of national forest reserves in the Southern Appalachian Mountains and the White Mountains of New Hampshire. It remains for the thoughtful and patriotic citizens of the country to work up a sentiment so strong for these reserves that Congress will be compelled to take early and favorable action in the matter. Tremendous business interests in the regions themselves are vitally concerned, the agricultural and manufacturing industries of wide surrounding country are no less seriously affected, consequently the movement for these two forest reserves becomes one that affects our general prosperity.

The American Forestry Association, the Society for the Protection of New Hampshire Forests, and the Massachusetts Forestry Association have entered upon an active campaign to secure the early passage by Congress of bills creating the Southern Appalachian and White Mountain Forest Reserves. In this work these organizations deserve the hearty support of every person desirous of preserving and utilizing the resources of two rare regions whose welfare affect the whole country. A careful reading of the articles in this number, it is felt, will enlist the co-operation of persons who are not already familiar with the situation.

Progress in Wyoming

The State of Wyoming is to be congratulated on the prospects of development under the Reclamation law,

as the work of the various engineering parties proceeds.

The Pathfinder tunnel was completed on August 15, the contract for the construction of the Pathfinder dam was let during the month and work promptly begun. Recently the Secretary of the Interior awarded two important contracts in connection with the Shoshone project: The Shoshone dam to Prendergast & Clarkson, of Chicago, Ill., for \$515,730., and the Corbet tunnel to Chas. Spear, of Billings, Mont., for \$594,325.

The dimensions of the Shoshone dam are well known. The Corbett tunnel will be about 18,000 feet long and will be used to divert about 1,000 cubic feet of water per second from the river for irrigating lands in the vicinity of Garland and Frannie, Wyoming.

Pumping Projects in North Dakota

It is believed by the engineers of the Reclamation Service in charge of the work that so far as the engineering features and the people are concerned, the Williston, Nesson, and Buford-Trenton pumping projects in North Dakota will be ready for construction next spring.

During the latter part of August, 1904, a party of engineers arrived in North Dakota for the purpose of making a reconnaissance of the state to locate feasible pumping projects. A hasty examination of the territory was first made, the report of Prof. F. A. Wilder, of the North Dakota Geological Survey, and the maps of the Missouri River Commission studied, and field work was commenced. Chief Engineer, F. H. Newell, directed that

preliminary surveys be pushed to completion as soon as practicable in order that land owners whose properties would come under the works might have a clear understanding of the plans of the Reclamation Service and a full knowledge of the cost of the water rights.

The banks of the Missouri River between Fort Buford and Bismarck, a distance of 300 miles, have been carefully investigated, and it is believed to be feasible to lift the water of the river to low flats by pumping. Extremely favorable features are found in the abundance of water and in the cheap and plentiful supply of fuel.

The Buford-Trenton project as planned will cover approximately 18,700 acres; the Williston project, 39,000, and the Nesson project 28,600 acres. A board of consulting engineers will convene at Williston, North Dakota, on September 18th to consider designs for these systems.

Reclamation Contracts Awarded Proposals for the construction of the Pathfinder dam, North Platte project, advertisements for which have twice been issued, have been opened at Denver, Colorado, and the lowest bidder was found to be N. S. Sherman, Oklahoma City, Oklahoma. The amount of Mr. Sherman's bid was \$459,260.

The Secretary of the Interior has executed the contract and approved the bond of E. A. Hess, of Lyons, Iowa, for the construction of a telephone system in connection with the Fort Buford reclamation project, Montana and North Dakota. This system consists of four telephone stations and about seventy miles of pole line, beginning opposite Glendive, Montana, on the west side of Yellowstone River, extending northward down Yellowstone Valley, generally following the country road, and ending near the junction of the Yellowstone and Missouri Rivers at a point nearly opposite Buford, North Dakota, on the Great Northern Railroad. ~~Five bids~~

were received, of which that of Mr. Hess—\$15,939.45—was the lowest.

The Secretary of the Interior has also executed a contract with the Widell-Finley Company, of Mankato, Minn., for the construction of seven and a half miles of main canal, Fort Buford project. Seven bids were received of which that of the Widell-Finley Company—\$163,367.50—was the lowest.

The Secretary of the Interior has executed the contract and approved the bond of Monarch & Porter, of Des Moines, Iowa, for the construction of schedules 3 and 4, Minidoka project, Idaho, which consist of 63.5 miles of laterals and branches. The bid of the successful contractors was for \$194,826.75.

A contract for the construction and completion of the Pathfinder dam and auxiliary works, North Platte project, Wyoming, has been awarded by the Secretary of the Interior to the Geddis & Seerie Stone Company, of Denver, Colorado. The amount of the company's bid was \$482,000.

According to the terms under which the bid was made work must begin within thirty days after the signing of the contract, and the entire work shall be completed on or before Nov. 1, 1908.

The Secretary of the Interior has awarded the contract for the construction of Yuma dyke, Yuma project, Arizona-California, to Miller & Peasley, of Los Angeles, California. Four bids were received, that of Miller & Peasley—\$66,325—being the lowest.

Utah Project Approved

The Secretary of the Interior has approved the preliminary plans of the engineers of the Reclamation Service for an irrigation project in northeastern Utah, known as the Strawberry Valley project, and as soon as the water users, through the Water Users' Association formed for the purpose, make proper adjustment of water rights and guarantee the return of the reclamation fund, construction will be promptly undertaken.



REV. DR. EDWARD EVERETT HALE

Chaplain of the United States Senate, and whose pen and voice have been enlisted on the side of practically every great movement of the last sixty years. Dr. Hale was among the very first to advocate the establishment of a White Mountain Forest Reserve.

Investigations by the Reclamation Service have been in progress in the State of Utah for over two years. These have extended to the reconnaissance of several localities and the possibilities of reclamation therefrom, and more detailed studies have been made of Utah Lake and the possibilities of its development, but these failed to develop a feasible project.

In the Strawberry Valley, on one of the tributaries of the Duchesne River, it is found that water can be stored in that valley and taken to the Spanish Fork by a tunnel. The capacity of the reservoir will be approximately 100,000 acre-feet, and the tunnel will be about 19,000 feet in length. Borings have been made along the line of the tunnel and no unusual difficulties have been discovered which might threaten the success of the project.

The lands which can be covered by the combination of stored water from Strawberry Valley and the natural flow of Spanish Fork consist of about 50,000 acres. Approximately one-half of this area is already irrigated but receives an insufficient supply of water. The land to be benefited is all in private ownership.

Owing to the uncertainties of estimates on the tunnel it is at present impossible to state with any degree of accuracy the cost of the project.

Michigan Forestry Meeting The initial, or organization meeting of the Michigan Forestry Association was held in Grand Rapids August 29 and 30, with a large attendance of lumbermen, business men, manufacturers, students, and others interested in forestry in Michigan. The first day's session was devoted to short speeches from a number of prominent members of the new Association, including Thornton A. Green, Loyal A. Knappen, Charles W. Garfield, Filibert Roth, George B. Horton, Hon. Arthur Hill, and others. The aim of the convention was expressed in the address of Prof. Roth: to get members to express their faith

in reforestation, to learn what to do, and to do it. Considerable enthusiasm was elicited through the appeal of Prof. Roth, and others, for reforestation in Michigan, and the adoption of conservative forestry throughout the state. At the final session on August 31, all editors of the state were voted honorary members of the association, with privileges of active membership. A vigorous campaign of education was outlined, and the following officers elected: President, John H. Bissell, Detroit; Vice-President, Thornton A. Green, Ontonagon; Secretary, T. M. Sawyer, Ludington; Treasurer, J. J. Hubbell, Manistee; Executive Board: Mrs. Francis King, Alma; C. J. Monroe, South Haven; Dr. Lucius Hubbard, Houghton; Walter C. Winchester, Grand Rapids; H. N. Loud, Au Sable; George B. Horton, Fruitridge.

With such a strong personnel, and with the energy displayed at this meeting infused into the vigorous campaign already planned, the Michigan Forestry Association will undoubtedly prove a power for good in Michigan.

Telephone for Reserves For the better protection of the forest reserves the Forest Service, in co-operation with the Weather Bureau, will install a system of telephone lines and stations on them as rapidly as possible. The first system will be installed on the Big Horn Forest Reserve, in Wyoming. This telephone service will enable the forest rangers to notify one another, without delay, when forest fires break out. In so large an area as the Big Horn Forest Reserve, which comprises 1,151,680 acres, the value of rapid communication is obvious, and there can be no doubt that the elimination of delay will result in a striking improvement in the control of forest fires.

It is greatly to be hoped that this highly practical system of fire warning may be extended in due course to other reserves. This putting out of a forest fire may often depend upon immediate knowledge of its origin and

whereabouts; so that this new fire alarm device ought apparently to produce excellent results.

Mr. Clothier Leaves Service The Mississippi Agricultural and Mechanical College, at Agricultural College, Miss., has recently created the position of instructor of forestry and plant breeding in the institution, and Mr. George L. Clothier, of the United States Forest Service, has been chosen by the college authorities to fill this important position. In addition to giving forestry instruction in the college, Mr. Clothier will carry on propaganda work in forestry in connection with farmers' institutes and by means of bulletins issued from the agricultural experiment station.

In co-operation with the Forest Service a special study will be made of various forest problems of direct interest to the state, among which are: Forest Management for Woodlot Owners; Forest Planting for the Reclamation of Waste Lands; Method for Preventing Erosion Through Forest Planting and Preservation; Forest Survey of the State. The authorities of the state have shown themselves fully alive to the need of such work, and under the able direction of Mr. Clothier we may expect that the State of Mississippi will soon formulate a wise and practical forest policy.

Forest Reserve Personals Forest Inspector Benedict, of the Forest Service, is now in temporary charge of the Pinal Mountain Forest Reserve, in Arizona.

Mr. Robert J. Moore, forest ranger in the Madison Forest Reserve, in Montana, has been promoted to the position of Forest Ranger in charge of the recently created Elk Horn Forest Reserve, in Montana, and established headquarters in Highwood, Montana, on September 20th.

Forest Ranger W. W. Hooper, who has been acting as ranger in charge of the Leadville Forest Reserve, in Colorado, has been placed permanently in charge of that reserve.

Forest Supervisor F. A. Fenn, of the Forest Service, reports from Boise, Idaho, that he assumed charge on September 1 of the Wiser, Sawtooth, and Fayette Reserves, in Idaho. He has been instructed to furnish the Department of Agriculture with the names of nine men for appointment to the position of forest ranger, to conduct the business of the reserves, until the results of the Civil Service examinations for the position of forest ranger are made known.

Mr. W. L. Veatch, of the Forest Service, has resigned from the post of supervisor of the White River Forest Reserve, in Colorado, and Forest Ranger Harry Gibler has been placed in charge temporarily.

Mr. Charles A. Scott, of the Forest Service, who has been making a preliminary examination of a nursery site to be used for reforestation purposes in the Garden City Forest Reserve, in Kansas, will visit the Black Hills Forest Reserve, in South Dakota, for the purpose of collecting bull pine seeds. The work of seed collection will probably engage Mr. Scott some three or four weeks, after which time he will return to Garden City.

Forest Supervisor James E. Meeks, of the Salt Lake Forest Reserve, in Utah, transmitted his resignation on September 12th. It was accepted and Forest Ranger E. H. Clark, of the Manti Forest Reserve, was ordered to go to Murray, Utah, to assume charge of the Salt Lake Forest Reserve.

Cooperative Work of Forest Service As a result of the attendance of a member of the Forest Service at the Farmers' Congress held at Amarillo, Texas, in August, a tree-planting club is to be organized in the Texas "Panhandle." This movement is of considerable importance since the region is naturally treeless, though there is abundant evidence that certain kinds of trees will grow, if properly planted and cared for. The object of the organization is to encourage the making of tree plantations, to experiment systematically with trees that seem likely

to thrive under the conditions there found, and to provide for obtaining the necessary planting material in the most advantageous way. When this club shall have been successfully organized, the Forest Service promises to send a man to the "Panhandle" to help the tree planters to make the most effective use of their land and planting material.

The study of railroad tie production which the Forest Service is making in co-operation with the Northern Pacific Railway Company, in Minnesota, is nearing completion. The field force is now in Hubbard county, where figures are being gathered to determine the possible yield in ties of jack pine. These figures, which were completed September 1, and show the yield of areas fully stocked with jack pine and will so be of value also in estimating the yield of planted areas. An estimate of the whole standing supply, and of the character of the lumber in northern Minnesota, is well under way.

The study of forest conditions in the southern part of New Hampshire, which the Forest Service is making in co-operation with the state, has progressed so well that the map work is now completed. The mapping of the northern part of the state was done in a previous forest study, also co-operative, so that the present maps supplement the former ones, with which they show forest conditions over the whole of New Hampshire.

On the forest maps are indicated the percentage of barren and abandoned lands, the area of forest land, the percentage of virgin timber, and the character of the forest, together with the area of burned land.

The attention of the field force will now be devoted to a study of second-growth spruce, with a view to determining its value as a woodlot species.

Black Hills Timber Sale

Application has been made for the purchase of 50,000,000 feet of western yellow pine timber in the Black Hills Reserve, located princi-

pally in South Dakota. This timber is classed as dead and insect infested. For the past five years a bark beetle has been preying on the western yellow pine of that region, and has done immense damage. The beetle bores through the bark, and the larvae seriously affect the wood. It becomes discolored to a depth of three or four inches, its strength is destroyed, and it thus becomes useless for timber. Every year the condition of the infested trees becomes worse.

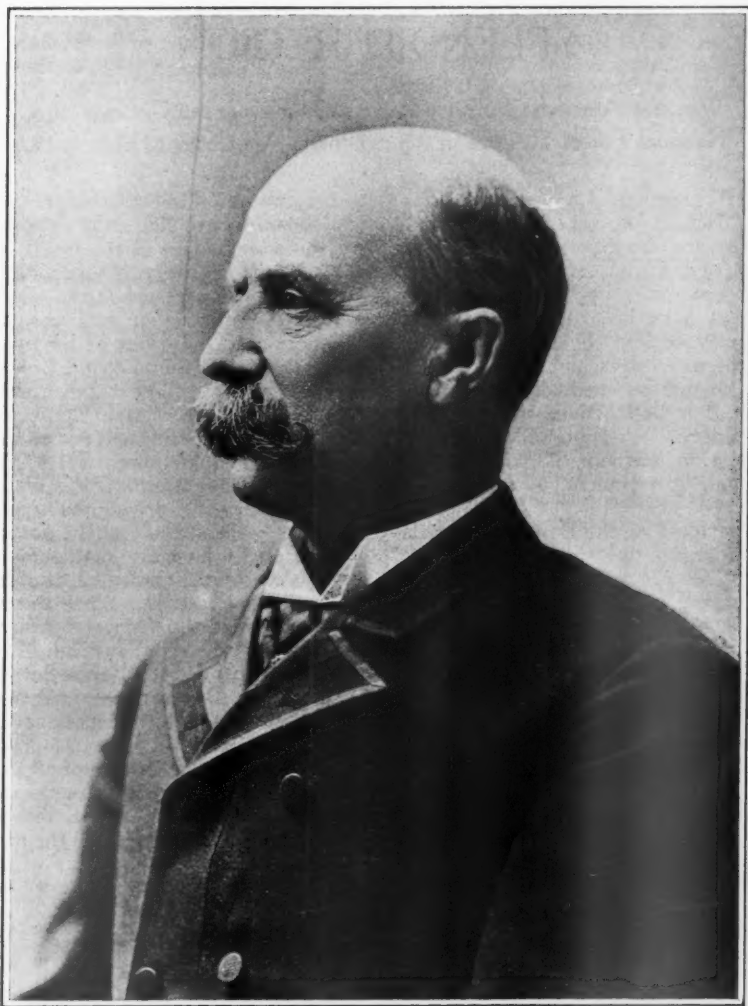
Under the law none of the timber in this reserve can be exported from the State. The local demand is limited, and covers chiefly railroad ties, mine props, and general construction purposes. During the early stages of beetle attack the timber is good and should be promptly cut. There is possibly a quarter of a billion feet of such timber now in the reserve, very much of which will be wasted, as home consumption is not large enough to use it before the beetles have rendered it valueless.

Fire Protection for Nursery

For the protection of the forest plantations recently made in the mountains back of Pasadena, California, a system of fire breaks is being constructed. They follow the sharp "backbone" of the main ridges and are strips on which the brush is grubbed out for a width of from 12 to 30 feet, with connecting trails or secondary lines where needed. This is the first systematic and extensive work of fire-line construction attempted in these mountains and the cost thus far has been very reasonable. Upon the completion of these lines the nursery at Henniger's Flats and the new plantations will be well protected and the extensive sweep of a fire prevented.

Mr. Shaw Transferred

Mr. A. C. Shaw, chief of the Public Lands Division in the Land Office, has been transferred to the Bureau of Forestry, where he will act as examiner in matters of privileges, claims, rights of way, etc., within the National Forest Reserves.



HON. J. H. GALLINGER

United States Senator from New Hampshire, a conspicuous member of the Upper House of Congress. Senator Gallinger introduced a bill for the establishment of a White Mountain Forest Reserve at the last session of Congress. His reasons for the Reserve are clearly set forth elsewhere in this number.

FOR THE PRESERVATION AND FUTURE DEVELOPMENT OF A SPLENDID REGION

Why the American Forestry Association Favors the Creation of a National Forest Reserve in the Southern Appalachian Mountains

THE creation of a Southern Appalachian Forest Reserve would secure the best permanent development of a region of vast commercial and economic importance. Its resources have been steadily and dangerously depleted by reckless lumbering, by forest fires, and by flood. Without change in methods of management, this destruction will go on increasingly. Prompt and effective change in methods is possible only through government ownership and care.

That part of the Southern Appalachian region in which the proposed forest reserve will be situated is rich in timber, water power, and minerals. It also possesses limited, but definite, agricultural opportunities. It is of the first importance, not only to the region concerned, but to the whole South, that these resources be wisely used. The movement for the creation of the Appalachian Forest Reserve is not based upon sentiment. It rests upon the understanding of the commercial and economic advantage of the preservation by wise use, of resources which originally were vast, but already so far depleted that the end is clearly in sight.

RESOURCES OF THE SOUTHERN APPALACHIAN REGION.

Timber.—The greatest single resource of the Southern Appalachian Mountain region is its timber. The region contains the largest and the most valuable hardwood forest in the United States. Present methods of lumbering are reckless, expensive, and destructive, not only to the lumber industry itself, but to water power, and

to agriculture. Conservative methods of lumbering are not only necessary for the perpetuation of the forest, but advisable from every other point of view. Those interested in the lumber industry of this region will raise the question as to the effect of the establishment of the reserve on the production of lumber. Under government supervision conservative lumbering will not only be permitted, but encouraged. All mature timber will be sold at once, without waiting for a rise in timber values, as private owners so often do. The attitude of the government from a business standpoint, is well shown by the management of existing forest reserves. Since the administration of the federal forest reserves was transferred from the Interior Department to the Forest Service, of the U. S. Department of Agriculture, timber sales have increased five times in amount.

Not only will the cutting of all merchantable timber consistent with good management be encouraged, but dependant forest industries and the manufacture of forest by-products will be actively fostered. The net result will be not only to prevent decrease but make a steady increase, in production incident to the forest.

Water Power.—The application of the vast possibilities for the utilization of water power in the Southern Appalachian region have just begun. Water power values depend essentially upon constancy of flow, which in turn depends more than any other factor upon the maintenance of a permanent and sufficient forest cover on the mountain slopes. In the year 1901 alone, floods caused \$10,000,000 dam-

age to various property interests along streams rising in the Southern Appalachian region. Disastrous floods will continue to increase in severity unless mountain slopes are protected from fire and wasteful cutting. This region is one which receives an unusually heavy rainfall. The heavy mountain rain storms cannot, of course, be prevented, and it is but natural that with such torrential rains falling on steep mountain sides floods are bound to occur. But with proper care of the forests the danger and damage can be minimized. In order that these forests may be used to best advantage for water control, a change in their handling must come very speedily.

Agriculture.—The agricultural possibilities of this region would, under a reserve administration, be directed into proper channels. Those areas that are best suited to agriculture would be studied and pointed out, and the use of them encouraged, while the uselessness of attempting to farm the steep upper slopes of the mountains, as shown by the sad experiences of many settlers, would be averted. Careful forest management would directly benefit agriculture. Protection of mountain slopes would mean greater immunity from floods in the valleys, and consequently greater stability to agriculture.

Health and Pleasure Possibilities.—The health-giving qualities, and the beautiful scenery of this region are unexcelled, and it is accessible to a larger number of people than any other in the United States. The establishment of the proposed forest reserve would insure in an adequate degree, the protection of fish and game, and offer opportunities for the building of resort hotels, summer homes, etc. It would encourage not only the business man to use the resources of the country, but it would be an effective and increasing impetus to settlement by people there for health and pleasure, and to tourist travel.

POLICY OF THE FOREST SERVICE IN HANDLING FOREST RESERVES.

The following extract from the regulations and instructions of the Forest Service in handling the western forest reserves gives a clear view of the government's attitude toward the public where their interests touch:

"The timber, water, pasture, mineral, and other resources of the forest reserves are for the use of the people. They may be obtained under reasonable conditions, without delay. Legitimate improvements and business enterprises will be encouraged."

FOREST RESERVE PRIVILEGES GRANTED BY THE FEDERAL GOVERNMENT.

The following are the more usual rights and privileges granted in the forest reserves, based upon demands already made upon the Forest Service. Other privileges which do not amount to a disposal of the land are granted. In fact requests for privileges are encouraged along any line that utilizes the resources of the reserves in a proper manner, the whole plan, as stated before, being to develop the resources of the forest reserves to their highest point of usefulness consistent with good business management.

(a) Trails and roads to be used by settlers living in or near forest reserves.

(b) Schools and churches.

(c) Hotels, stores, mills, stage stations, apiaries, miners' camps, stables, summer residences, sanitariums, dairies, trappers' cabins, and the like.

(d) Grazing and agricultural privileges, together with such inclosures, etc., as may be necessary for the use of such privileges and not harmful to the forest reserves.

(e) Canals, ditches, flumes, pipe lines, tunnels, dams, tanks, and reservoirs, within forest reserves.

(f) Steamboats and ferries operated within forest reserves.

(g) Aerial tramways and wire-rope conveyors.

(h) Railroad, tramroads, telegraph, telephone, or electric power lines, and

the plants or buildings necessary for their use.

(i) Other similar privileges which do not amount to a disposal of the land.

RESUME OF SOUTHERN APPALACHIAN RESERVE CAMPAIGN.

Nov. 22, 1899—Appalachian National Park Association organized at Asheville, North Carolina.

Jan. 2, 1900—Memorial of the Appalachian National Park Association presented to Congress and referred to the Committee of Agriculture.

April 17, 1900—Officers of the Park Association appear before the Committee on Agriculture presenting the cause of the Appalachian National Park Association.

April 21, 1900—Senator Pritchard introduced a bill praying for an appropriation of five thousand dollars for a preliminary investigation.

April 26, 1900—Senator Pritchard's bill asking for appropriation for investigation passed, became a law on July 1st.

Summer of 1900—The Bureau of Forestry, with the co-operation of the Geological Survey, investigate the Southern Appalachian Mountains.

Jan. 1, 1901—Secretary Wilson, of the Department of Agriculture, sends report to Congress through the President regarding the preliminary investigation made.

Jan. 19, 1901—President McKinley presents Secretary Wilson's report with a special message to Congress recommending this report to the favorable consideration of the Congress.

Jan. 10, 1901—Senator Pritchard introduces a bill praying for an appropriation of five million dollars

for the establishment of a forest reserve in the Southern Appalachian Mountains, approximating two million acres. Bill referred to the Committee on Agriculture.

Jan. 28, 1901—Senator Pritchard's bill asking for an appropriation of five million dollars was reported back favorably by the Committee on Agriculture.

Jan. 18, 1901—North Carolina passed a bill ceding to the National government the authority to acquire title for forest reserve purposes, with exemption from taxes.

Jan. 29, 1901—South Carolina and Georgia passed similar bills.

March 22, 1901—Alabama did likewise.

March 28, 1901—Tennessee and Virginia passed like bills.

July 3-10, 1901—Secretary Wilson, accompanied by Gifford Pinchot, chief of the Bureau of Forestry; J. A. Wilson, private secretary to Secretary Wilson; W. J. McGee, U. S. Bureau of Ethnology; F. H. Newell, U. S. Geological Survey; J. A. Holmes, State Geologist; Hon. Theo. F. Klutz, member of Congress of Seventh District of North Carolina, spent ten days in the Southern Appalachian Mountains making a personal investigation of the sites wherein it is proposed to establish the Appalachian Forest Reserve.

Dec. 10, 1901—President Roosevelt transmits report of the Secretary of Agriculture on the forests, rivers, and mountains of the Southern Appalachian region, to Congress, with recommendation that Congress consider it favorably.

In addition to the foregoing a bill in 1904 passed the United States Senate but the House took no action on it.





Mixed Hardwood and Pine Forest on Oconalufy River, Swain County, N. C.

On the lower mountain slopes and ridges the pines are often mixed with the hardwoods. But whatever the nature of the trees, the frequent fires are destroying the undergrowth and humus and thinning out the trees, thus diminishing the commercial value of the forest, facilitating the erosion of the soil, and lessening its capacity for storing water.

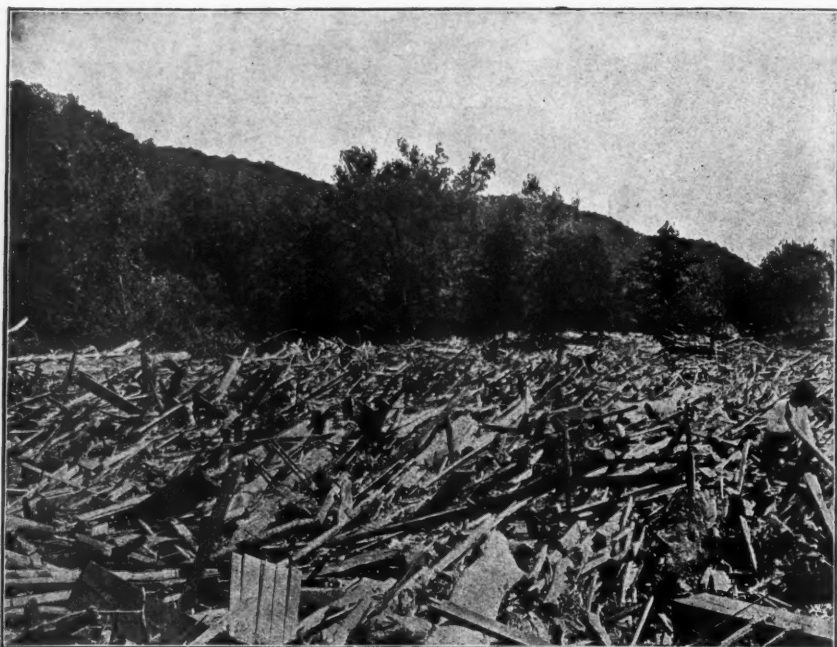
PRESIDENT FAVORS SOUTHERN RESERVE

Reprint of his special message to Congress in which he strongly favors the creation of a National Forest Reserve in the Southern Appalachian Mountains

To the Senate and House of Representatives:

I transmit herewith a report of the Secretary of Agriculture, prepared in collaboration with the Department of the Interior, upon the forests, rivers, and mountains of the Southern Appalachian region, and upon its agricultural situation as affected by them. The report of the Secretary presents the final results of an investigation authorized by the last Congress. Its

conclusions point unmistakably, in the judgment of the Secretary and in my own, to the creation of a national forest reserve in certain parts of the Southern States. The facts ascertained and here presented deserve the careful consideration of the Congress; they have already received the full attention of the scientist and the lumberman. They set forth an economic need of prime importance to the welfare of the South, and hence to that of the



Debris from Floods on Nolichucky River, East Tennessee. May 21, 1901

This debris consisting of the wreck of farmhouses, furniture, bridges, cattle, and probably several human bodies, covered 6 acres of fertile farm land near Erwin, Tenn. The Southern Appalachian region is one with an exceedingly heavy rainfall, and though they cannot entirely prevent floods the preservation of the forests on the mountain slopes will minimize the damage from them.

nation as a whole, and they point to the necessity of protecting through wise use a mountain region whose influence flows far beyond its borders with the waters of the rivers to which it gives rise.

Among the elevations of the eastern half of the United States, the South-

wood forests were born on their slopes and have spread thence over the eastern half of the continent. More than once in the remote geologic past they have disappeared before the sea on the east, south, and west, and before the ice on the north; but here in this Southern Appalachian region they



View of Flood Damages on Doe River, Tennessee, May, 1901.

ern Appalachians are of paramount interest for geographic, hydrographic, and forest reasons, and, as a consequence, for economic reasons as well. These great mountains are old in the history of the continent which has grown up about them. The hard-

have lived on to the present day.

Under the varying conditions of soil, elevation, and climate many of the Appalachian tree species have developed. Hence it is that in this region occur that marvelous variety and richness of plant growth which have

led our ablest business men and scientists to ask for its preservation by the Government for the advancement of science and for the instruction and pleasure of the people of our own and of future generations. And it is the concentration here of so many valuable

The conclusions of the Secretary of Agriculture are summarized as follows in his report:

"1. The Southern Appalachian region embraces the highest peaks and largest mountain masses east of the Rockies. It is the great physiographic



Flood Damages to Railway on Nolichucky River, East Tennessee, May, 1901.

species with such favorable conditions of growth which has led forest experts and lumbermen alike to assert that of all the continent this region is best suited to the purposes and plans of a national forest reserve in the hardwood region.

feature of the eastern half of the continent, and no such lofty mountains are covered with hardwood forests in all North America.

"2. Upon these mountains descends the heaviest rainfall of the United States, except that of the North Pacific

Coast. It is often of extreme violence, as much as 8 inches having fallen in eleven hours, 31 inches in one month, and 105 inches in a year.

"3. The soil, once denuded of its forests and swept by torrential rains, rapidly loses first its humus, then its rich upper strata, and finally is washed in enormous volume into the streams, to bury such of the fertile lowlands as

to the Mississippi. Along their courses are agricultural, water-power, and navigation interests whose preservation is absolutely essential to the well-being of the nation.

"5. The regulation of the flow of these rivers can be accomplished only by the conservation of the forests.

"6. These are the heaviest and most beautiful hard-wood forests of the



Valley Lands Badly Washed by Floods.

These fertile lands in the Southern Appalachians will all be washed away in a few decades unless the forests on the mountain slopes are protected.

are not eroded by the floods, to obstruct the rivers, and to fill up the harbors on the coast. More good soil is now washed from these cleared mountain-side fields during a single heavy rain than during centuries under forest cover.

"4. The rivers which originate in the Southern Appalachians flow into or along the edges of every State from Ohio to the Gulf and from the Atlantic

continent. In them species from east and west, from north and south, mingle in a growth of unparalleled richness and variety. They contain many species of the first commercial value, and furnish important supplies which can not be obtained from any other region.

"7. For economic reasons the preservation of these forests is imperative. Their existence in good condition is

essential to the prosperity of the lowlands through which their waters run. Maintained in productive condition they will supply indispensable materials, which must fail without them. Their management under practical and conservative forestry will sustain and increase the resources of this region and of the nation at large, will serve as an invaluable object lesson in the advantages and practicability of forest preservation by use, and will soon be self-supporting from the sale of timber.

"8. The agricultural resources of the Southern Appalachian region must be protected and preserved. To that end the preservation of the forests is an indispensable condition, which will lead not to the reduction, but to the increase of the yield of agricultural products.

"9. The floods in these mountain-born streams, if this forest destruction continues, will increase in frequency and violence, and in the extent of their damages, both within this region and across the bordering States. The extent of these damages, like those from the washing of the mountain fields

and roads, can not be estimated with perfect accuracy, but during the present year alone the total has approximated \$10,000,000, a sum sufficient to purchase the entire area recommended for the proposed reserve. But this loss cannot be estimated in money value alone. Its continuance means the early destruction of conditions most valuable to the nation, and which neither skill nor wealth can restore.

"10. The preservation of the forests, of the streams, and of the agricultural interests here described can be successfully accomplished only by the purchase and creation of a National Forest Reserve. The States of the Southern Appalachian region own little or no land, and their revenues are inadequate to carry out this plan. Federal action is obviously necessary, is fully justified by reasons of public necessity, and may be expected to have most fortunate results."

With these conclusions I fully agree; and I heartily commend this measure to the favorable consideration of the Congress.

THEODORE ROOSEVELT.

White House, Dec. 19, 1901.



Flood Damages to Mining Settlement, Norwood, W. Va., 1901.



An Original Southern Appalachian Mountain Forest, Transylvania County, N. C.



Cæsars Head, South Carolina.

The fires and axe are destroying the best growth on these steep, rocky mountain sides.

VALUE OF A FOREST RESERVE TO NEW ENGLAND

BY

J. H. GALLINGER

United States Senator from New Hampshire

THE sentimental side of a White Mountain Forest Reserve has been warmly discussed during the past few years, and in all parts of the country it has its able and eloquent advocates. The æsthetics of the situation appeal strongly to all who have visited the White Mountain region, and personally witnessed the devastation of the magnificent forests that is now under way. It is not strange that lovers of the beautiful should unite in protesting against the wholesale destruction of the timber lands of Northern New Hampshire, and I am glad to unite with them in any effort that will tend to stay the ravages of the unscientific and wasteful methods now in vogue. But there is a practical as well as a sentimental side of the question, to which I beg briefly to call attention.

The important relation between the perpetuation of the forest and the abandoned farm is not always appreciated. When lumbering ceases, the mills and other wood-working industries disappear, and the farms in many parts of New England no longer pay, so that the farming people move away. It is a curious fact that some of the problems of the Orient in ancient times and of Italy in Roman times are being repeated in our day on American soil. But our people are slowly learning that an intelligent use of the forests will perpetuate its products, and steady the industries dependent upon them. The forest product in New England, especially in the last decade, since paper has been made in large quantities from spruce pulp, is of the utmost importance. It ranks next in

value to agriculture and manufactures, and includes not only lumbering, saw mills, and paper and pulp mills, but also the many wood-working factories that make articles all the way from furniture to shoe pegs. We are told in the latest census that in New Hampshire alone there are \$8,163,081 invested in 29 paper and wood pulp plants, employing 2,391 persons, paying annually \$1,036,856 in wages, and producing annually a gross product valued at \$7,244,733.

These figures are for one of the forest industries in one of the New England States, but they suffice to show the great number of families dependent upon the forest—families of woodsmen, mill hands, factory operatives, managers and owners. In the well being of the forest all New England is vitally interested, and the sentimental argument of saving the forests to be sure of summer boarders is inconsequential in comparison with other and greater interests which are affected. The proper care of the remaining spruce forest, and of our hard wood and second growth trees, should be undertaken promptly, in order that we may not suffer in New England as we did from the disappearance of the primeval crop of white pines.

Because of the time element involved it is not possible for individuals, nor even for corporations, to cut the forests in a manner that ensures a future crop. To hold the property involves, as a rule, a loss in taxes and fire protection that benefits only a future generation. The principle is now recognized in many of our States, in New York, Pennsylvania, Michigan

and others, and by the National Government in setting aside 80,000,000 acres of forest reservation in the West, a territory larger than all New England, that for non-agricultural lands,

other New England States anxious to secure a national forest reservation of sufficient size to guarantee the continued navigation of those streams, their uninterrupted use for manufac-



Mount Bond, New Hampshire, Showing Clear Cutting on the Upper Slopes.

government ownership alone ensures a profitable return.

The flow of nearly all of the important rivers of New England from the White Mountain region makes the

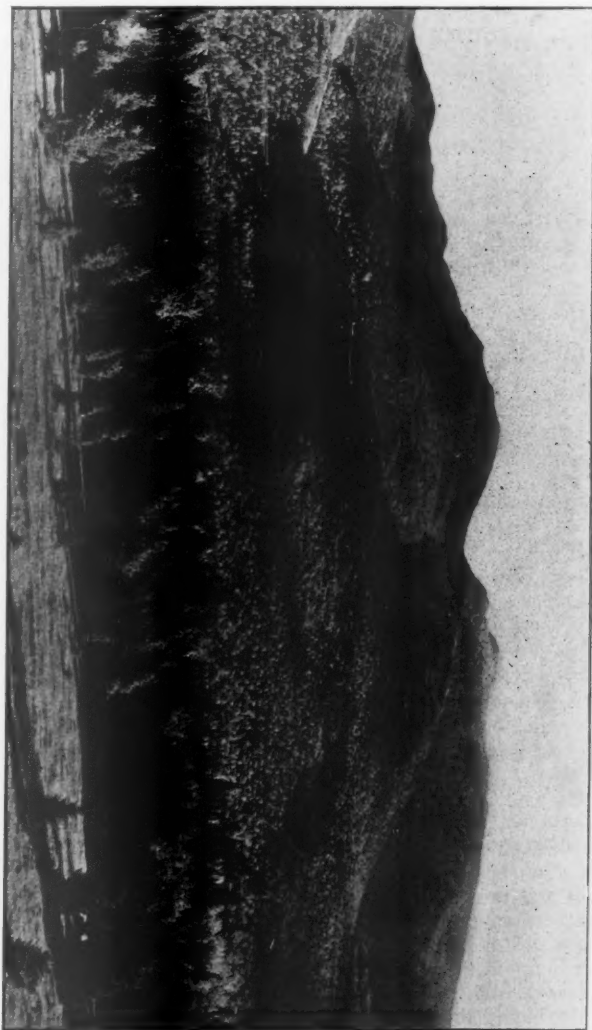
turing power, and their purity for domestic purposes in the cities to which they supply drinking water. Such a reservation would also steady the wood-working industries of all New

England. Can any matter be more far-reaching in its influence?

New Hampshire has appropriated \$5,000, with which a careful examina-

tional Government to the utmost in the effort to make the proposed reservation a fact; but unfortunately New Hampshire is not financially able to

The Randolph Forest on the Presidential Range. Four hundred men have been cutting in it for three years. One more winter (1905-6) will finish it. Only one other primeval forest, less attractively situated, remains on the Presidential Range.



tion of the mountain region has been made by the Forest Service at Washington, and New Hampshire will co-operate with other States and the Na-

undertake the project of establishing a White Mountain forest reserve unaided and alone, and she should not be expected to undertake it.

AN APPALACHIAN FOREST RESERVE AND THE SOUTH

The immense importance of it to the industries of the South—Why the South should warmly support the project

BY

BENJAMIN LAWTON WIGGINS, L. L. D.

Vice Chancellor, University of the South

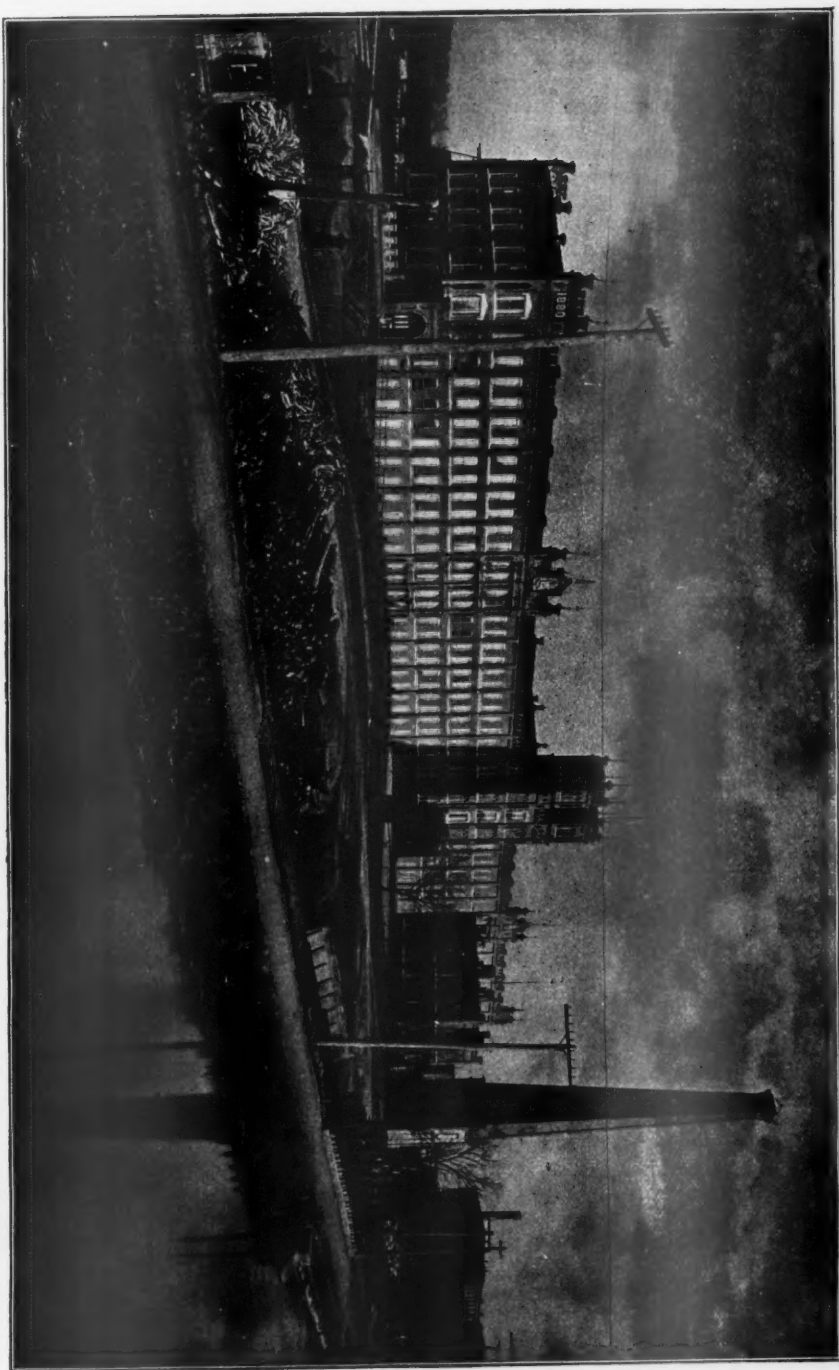
THERE are few more hopeful signs of progress in material things than the growing interest on the part of the American people in the protection of their forests. It is true that our timber interests are mainly owned by private capital, and in all likelihood will ever be so appropriated; but the influence of these gifts of nature on the general happiness and well-being of the human race has always given to them a semi-public character which can be easily understood. Never before in our history, however, has the subject of forestry been more earnestly and widely considered than now.

Surely the leading causes of this cheering indication is a recognition of the evils inflicted on all classes of society by the wholesale demolition of our timber districts and the growing conviction that unless some prompt check is imposed on this destructive process, even greater losses are to be expected. And, as has been frequently pointed out, these losses are not to be confined to this generation, but will be entailed on posterity. That we of the south are fast awakening to the sad reality now confronting the rest of the country is therefore only another striking proof of the fact that the interest of each of us is the interest of all. Hence the movement, now of several years' growth, which has for its object the protection of the timber interests in the southern Appalachian Mountain region, is at once a sign and a promise of better things to come.

One of the most striking features of the proposed reservation is the vast area of territory stretching from West Virginia and Virginia through Tennessee and the Carolinas to Georgia and Alabama. But even this does not represent the actual influence exerted by the vast region just indicated. For we must remember that the Appalachian district is the source of many of the most important rivers in fully one-half of the Southern States. In other words, those who are advocating the protection of the Appalachian forests are endeavoring to safeguard the farming, commercial, and manufacturing interests of one of the most important sections of the United States.

For there is scarcely an industry in any of the states touched by the proposed Appalachian reservation that is not directly affected by the river-systems whose reservoirs are in these mountain forests. This becomes plain to us when we recall, for example, the alarming frequency of those destructive freshets, due largely to the demolition of mountain forests, which not only impoverish the agricultural lands by robbing the soil and bring numberless woes to the farmer; but they also choke up our rivers and harbors, thus obstructing commerce, and imperil the rare wealth we have in the way of water power to propel the machinery of our mills.

Colonel William Elliott, of South Carolina, in a speech delivered in Congress on May 14, 1901, used the fol-



Improved Water Power on the Savannah River, at Augusta, Ga., Operating Cotton Mills.
The principal sources of this and other important rivers of the Southeastern States are within the region of the proposed Appalachian forest reserve; and the perpetuation of the water powers on these streams, valued at more than \$20,000,000 per annum, depends largely upon the preservation of these mountain forests.

lowing words which every well-wisher of the South might well lay to heart:

"Take, for example, the rice plantations on the South Carolina side of the Savannah River, which has its source in these mountains. Formerly they were more productive. The lands were exceedingly valuable. They were all cultivated in the most careful manner and yielded splendid returns. Whoever was so lucky as to own one of them was considered a rich man. What is their condition now? Many

which commenced some twenty years ago, just before the time when destructive freshets became so frequent."

It is well to bear in mind that the exhaustion of the timber resources of other sections of the country, together with the wonderful industrial development of the South during the past two decades, has produced an enormous demand for all kinds of southern lumber, not to speak of the devastating effects of forest fires. It is true these and similar dangers arising from a



Water Power on Broad River at Columbia, S. C.

of them, including their elaborate and expensive systems of irrigation, have been substantially abandoned, and the remainder generally show a loss at the end of the year instead of a profit. In the course of less than twenty years there has been a complete revolution from a state of great prosperity to one of utter prostration. What is the cause of all this? None other than freshets, all the time increasing in number and destructive power. All the evidence goes to show that the cause is the destruction of our mountain forests,

neglect of our best interests have been frequently pointed out. It is true we have in our various states Arbor Days and Forest Associations and sundry statutes directed against wantonly setting fire to woods. But the practical objects—indeed the impossibilities in the way of separate state control of the proposed reservation are obvious.

It is a matter of national importance and ought to be entrusted to federal administration. No part of the country need gain more by transferring the management of this proposed domain

to the general government than the Southern States. Their commerce, their agriculture, their manufactures demand a constant and uniform flow of water. This cannot be expected so long as the present state of things continues. On the contrary, unless some steps are immediately taken to conserve our reservoirs in the Appalachian region our rivers will not only become more torrential in the spring, but diminish in summer.

Even if the states were able to buy the rare region in question, which is

trial life of the South by the construction of the Panama Canal, the necessity, indeed the duty of protecting the Appalachian forests is thrust upon us in the most forcible manner. It is something more than a present economic necessity, involving the welfare of the South, it is one of those great secular interests affecting future generations of Americans.

There can be little doubt that the failure thus far to establish a Southern Appalachian Forest Reserve is due, in large measure, to the apathy



Water Power on Saluda River at Pelzer, S. C.

exceedingly doubtful, they would be unable to manage it with their lack of experience. Moreover, there would be seven or eight State Boards of Control with every opportunity for dispute and irritation. Of course the great object lesson it would afford us for still further protecting other regions unaffected by the rivers whose sources are in the Appalachian district can be readily understood.

When we consider the tremendous impetus that will be given the indus-

of the people who are most immediately concerned. Two Presidents have recommended it as of great public utility. The Secretary of Agriculture stands as he has stood from the beginning, upholding the project—yet it has advanced but little in the four or five years that the measure has been before the people. If this reserve is ever to be an accomplished fact it will be due to the people of the Southern States; not those who own land within the area that may be bought up, not



Stone Mountain Near Atlanta, Georgia.

The axe and fire have removed the forest; and the heavy rains have removed the soil which once covered the larger part of this rocky knob.

those who are on the borders of it, but the vastly greater number who live and do business in the country surrounding the mountain region.

From these highlands come the waters that make fruitful the farms and give power to the industries of practically every Southern State east of the Mississippi River. The people of the North and West realize that this question is first of all a local one—at any rate that one section of the country is more immediately concerned than any of the others. Yet they also see that it is a matter of importance to the entire country, and for this reason are ready to turn in and put their shoulders to the wheel to get this reserve. But they must first be assured that the South is heartily in favor of it; therefore it is directly up to the people and press of the South to head this great work with vigor.

Furthermore, all that the Adirondacks are to New York, the Berkshire Hills to Massachusetts, the White Mountains to New Hampshire, and all of them to the whole country, these southern mountains may be to the states that possess them. The American people are developing a love of outdoors that must be satisfied. No region in the United States has the qualities that attract the summer visitor and the possibilities of ready access, that the forested mountains of the South have. Private enterprise is slow in making them known. A great forest reserve there will create a demand that every part be opened to travelers.

So regarding it let us act promptly and wisely. And reason surely points out one way and that is to entrust the management of this magnificent domain to the wise, liberal, comprehensive administration of the general government.

REASONS FOR A NATIONAL FOREST RESERVATION IN THE WHITE MOUNTAINS

BY

PHILIP W. AYRES

Forester of the Society for the Protection of New Hampshire Forests.

THE reasons for a National Forest Reservation in the White Mountains are of two kinds, economic and æsthetic, of which the economic reasons are by far the more weighty and important.

1. The lumber interests in New England, including the pulp and paper plants and the wood-working factories, are second only to agriculture and manufactures in the amount of wages paid and the number of families supported. Anything that attacks any one of these great interests affects all of the others, and the lumber in-

terests is easily the most vulnerable because of the easy exhaustion of supply. A forest reservation would steady the towns, mills, and factories whose population is dependent on forest products.

From the complete exhaustion of their primeval white pine forests some years ago, the New England States have suffered severely. The furniture factories and many other wood-working plants have largely disappeared. Such sash-and-door factories as remain import their pine from Michigan and the West at a price that renders

them less able to compete in the general market. Such items are fundamental in New England's welfare. There is a supply of standing spruce on hand sufficient to keep the paper and pulp plants at work for twenty years at the present rate of consumption, and with the increase in population throughout the country, the rate of consumption is almost sure to in-

crease. The areas of spruce in the United States suitable for the manufacture of paper are limited, but they are said to be extensive in Canada. Shall we have to import supplies from Canada? (Thirty-seven per cent of the spruce used in New Hampshire last year was imported from there.) Will our paper mills move into Canada, or will new mills be erected in Canada to compete with our New

England establishments? It is not surprising that the paper makers and the lumbermen are in favor of a forest reservation in New England. The American Paper and Pulp Association, at its meeting in New York last year approved of a reservation in the White Mountains, and asked Congress to take speedy action. The National Wholesale Lumber Dealers' Associa-



Virginia Spruce with Dense Balsam Reproduction on Mt. Jackson, New Hampshire.

tion, and the National Board of Trade meetings in Washington did the same. So did the American Forest Congress. One reason why the Black Forest region in Germany is such a thriving manufacturing center is because the forests are owned by the government, the towns, and universities, and so managed that there is no danger of exhausted supplies. Compare this

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One reason why the Black Forest region in Germany is such a thriving manufacturing center is because the forests are owned by the government, the towns, and universities, and so managed that there is no danger of exhausted supplies. Compare this

with the ephemeral lumber town in this country.

2. The second strong reason for a forest reservation in New England, is that it would protect the water flow. A majority of the rivers in New England rise in the White Mountain region. The most important of these are the Connecticut, the Merrimack, the Saco, and the Androscoggin. Great enterprises are dependent upon their equable flow. They are the main source of power for the concentrated manufacturing establishments in New

the Merrimack is dependent upon the mountain forests, though in less degree than the Connecticut and the other large rivers.

3. Because all of New England is vitally affected, having interests that are paramount to those in any one state, the proposed reservation in the White Mountains is a matter for federal action. New Hampshire and Massachusetts have the most at stake, though Maine, Connecticut, and Vermont are not far behind. New Hampshire appropriated \$5,000 for an ex-



Barren Upper Slopes in the Presidential Range, White Mountains.

England, particularly of those making paper and cotton-cloth. Upon their purity depends the health of those large cities that use their waters for drinking purposes. Although certain manufacturing concerns on the Merrimack have not thus far shown a marked interest in the plans for a reservation, owing to the fact that the Merrimack has enormous natural reservoirs in Lake Squam, Lake Winnepesaukee, and Newfound Lake, with dams at their outlets making more even the flow in this river, yet it is true that the flow of

amination by the United States Forest Service of the entire mountain region. This examination has been made, and the report is replete with facts giving a full account of the situation as to the location of forest lands, their extent, condition and value, the influence of lumbering, fire and erosion. It shows also the effects of present management. The bill before Congress has reservation may not interfere with the progress of agricultural or other private holdings, nor with the forest in- been carefully drawn in order that a



North Sugar Loaf Mountain, Once Heavily Timbered, but now Practically Barren as a Result of Clean Cutting and Fire.

terests of those who will cut in accordance with rules laid down by the Secretary of Agriculture.

The New Hampshire Forestry Commission, and the Society for the Protection of New Hampshire Forests are



View Showing Results of a Severe Ground Fire in White Mountains

alert to render any possible assistance. So is the Massachusetts Forestry Association, and the Appalachian Mountain Club. The following public bodies in New England have asked Congress to take favorable action:

Connecticut State Lumber Dealers' Association, Rhode Island State Lumber Dealers' Association, New Hampshire Lumbermen's Association, New

ple from many states. Scarcely any other national playground is so largely used by the people of so many states as a refuge from the pressure of business and social life in the large cities. This was the foundation of Dr. Edward Everett Hale's address before the American Forest Congress last winter. The White Mountains are one of the nation's breathing places, and



Forest Lumbered Twenty Years Ago to a Diameter of Fourteen Inches—Now Ready for Another Cutting.

Haven and Coastwise Lumber Dealers' Association, Boston Merchants' Association, Boston Lumber Trade Club, Boston Associated Board of Trade.

4. The æsthetic value of a forest is a legitimate value. The White Mountains afford rest and recreation in one of the most thickly populated portions of the country, and are sought by peo-

ple should not be despoiled of their beauty. There are elms enough for wagon hubs without taking the most beautiful trees in the village street, and there is wood enough for furniture and paper without removing the few remaining primeval forests in the White Mountains. It is a question of how these forests best serve mankind, by standing or by being cut.

There are but two primeval forests remaining on the Presidential Range. The more attractive, the Randolph Forest, from which rise the peaks of Jefferson, Adams, and Madison, has been three-fourths removed in the last three years, leaving prominent ugly scars in its place on the mountains. The last and best fourth of it, up the "valley way" on Mount Madison, will probably disappear in the coming win-

tive action.

In addition to these reasons for a reservation in New England, a word should be said for the principle of a government ownership of non-agricultural land. There has been a great outcry against the lumberman which has been of no avail. It is also without reasonable foundation, for why should he, more than others, have regret Minnesota lumberman, has well



Land Cut Clear and Burned Over About Ten Years Ago.

ter. The other primeval forest is less accessible, on the Pinkham Notch side of Mt. Washington, and is threatened "for commercial purposes," having recently changed ownership. It is now too late even with prompt action, to do what could easily have been done two years ago. Four of the Sibylline books have been destroyed. But there is still sufficient reason for prompt and posi-

said, "The State has interests far beyond those of the individual." It is because the State is neglecting these interests that we suffer. Let us direct the energy that we have hitherto wasted in denunciation, into the more useful channel of State and National acquisition of lands not fit for agricultural for the future welfare of the people? As Mr. Weyerhaeuser, a promi-

ture. The States governments in New York, Pennsylvania, and Michigan, have made splendid beginnings. The federal government has set aside 80,000,000 acres in forest reservations in the West. They are even more important in the East, where population is more dense. By this means alone

can the great industries dependent upon wood supply be made permanent and steady. By this means alone can the water flow in great rivers be protected. When adequate reservations are secured there will be no lack of attractive forests in which tired humanity can find rest.

FOREST RESERVES IN IDAHO

Interesting Discussion of Forest Reserve Situation in Idaho
and Explanation of the Federal Forest Policy in General.

AN unusually interesting correspondence relating to the general forest policy of the government has just been published by the Forest Service, as Bulletin No. 67, entitled "Forest Reserves in Idaho." The major part of this correspondence, which deals specifically with forest reserve questions in Idaho, consists of letters from Senator W. B. Heyburn, of Idaho, to the President; the replies of the President; letters from Mr. Gifford Pinchot, Forester of the U. S. Department of Agriculture; and a letter on the federal forest reserve policy, with special reference to Idaho, by Senator Fred Dubois.

The discussion of the forest reserve situation in Idaho, which is very fully developed in the letters, and a thorough explanation of the federal forest policy in general, which has never before been so clearly and emphatically defined, lend to this bulletin exceptional and more than merely local interest.

Senator Heyburn, in several of his letters, makes warm protest against the proclamation of certain forest reserves in Idaho. His colleague, Senator Dubois, on the contrary, enthusiastically recommends their establishment, and declares that "to-day the forest reserves are administered * * * for the sole purpose of conferring the greatest benefit on the communities in which the respective reserves are situated."

One of the most striking passages of Senator Dubois's letter is that in which he asserts that the federal administration is now in fullest harmony with the desires of disinterested citizens throughout the West. He declares that he never at any time opposed the policy itself, though at first, with colleagues from the Rocky Mountain region, he "contended against the methods which were used in creating, maintaining, and controlling the reserves." "During the time when the forest reserves were first created," he writes, "reserves were created without sufficient safeguards to protect stock raisers, miners, lumbermen, agriculturists, and people of our section generally. The fight of the western men was constant and united. Our demands were set forth in numerous speeches, and finally were acceded to. The policy which controls the creation of forest reserves to-day and their administration is substantially the policy which the Representatives of the Western States in Congress have contended for, and is substantially what the West, through its Representatives, contended for."

The President, in one of his letters, replies vigorously to the protests of Senator Heyburn. The following sentences occur:

"The government policy in establishing national forest reserves has been in effect for some time; its good

results are already evident; it is a policy emphatically in the interests of the people as a whole, and especially the people of the west; I believe they cordially approve it; and I do not intend to abandon it."

The specific withdrawals in Idaho which Senator Heyburn opposed and which Senator Dubois recommended, now established as reserves or as additions to reserves, are as follows: Henrys Lake, Sawtooth, Payette, Squaw Creek Division of the Weiser, and Cassia, and additions to the Yellowstone and the Bitter Root.

Appended to the correspondence is a report of Special Agent Schwartz, of the General Land Office, based on "certain examinations of the Shoshone Forest Reserve temporary withdrawal,

in Idaho."

In the discussion of the advisability of withdrawing certain lands for forest reserves, it was objected that forest reserves discouraged settlement and worked hardship for those who had already acquired claims within the areas affected. According to the report of Special Agent Schwartz, about 90 per cent. of the claims which he examined have never been resided on by their claimants, as is required by law. It would appear, furthermore, that a considerable number of the claimants are railroad employees and others whose interests in their claims seem very indirect. On the whole, the report goes to show that the claims examined are in a large number of cases not legitimately held.

TRANSPLANTING OF BIGTREE SEEDLINGS

BY

S. J. FLINTHAM

Forest Assistant, U. S. Forest Service.

THE ancient race of the Sequoia, species of which in prehistoric times flourished over a wide range in North America, seems, from the destructive course of lumbering through the restricted present range of the two Sequoia species,—in the Coast and Sierra ranges of California, to be in a fair way to become extinct in time or to be maintained only in a few protected National Parks and Forest Reserves.

Despite their great antiquity both the species are of great virility. The coast redwood, reproducing itself readily by sprouting from the stumps after lumbering as well as by abundantly-produced seed, seems capable if protected of recovering its cut-over lands to some extent, and to have within its range a future timber importance in forest operations.

With the bigtree, however, such recovery appears more difficult. The species does not reproduce by sprouts, and though its light, wind-blown seed is spread to some distance, young growth is hardly to be found extending outside the well defined limits of the bigtree groves, and within them reproduction grows with difficulty under their shade.

The seed of the bigtree commands a good price. It is collected and the species propagated by nurserymen both at home and abroad, but mainly as an ornamental tree. Neither sapling nor young seedling reproduction is very abundant in the bigtree groves on the Sierra slopes, and little or no attempt has been made to transplant the wild forest-grown seedlings.

An interesting experiment, however, which has proved an entire success,

begun independently and continued with the approval of the Land Office, was started in the early spring of 1904 by Ranger L. L. Davis in charge of the General Grant National Park. He has succeeded in setting out small bigtree seedlings, collected from a few localities where they had come up naturally, to various sites about the park, in openings where they will be allowed a better chance to grow up.

The naturally sown seedling sites mentioned occurred where light ground fires, spread from small fires for the clearing up of the rubbish on the forest floor, had cleaned the ground of a heavy accumulation of litter. The germination of the seed of the bigtree is slightly difficult—ordinarily hindered by the heavy trash and litter accumulating under the Sequoia stand, but an opportune seed year allowed advantage to be quickly taken of such favorably cleared spots, and seedlings now two or three years old have started several thousand times as dense as they can live to grow up, the number of seedlings averaging on some spots over 2,500 to the square rod.

Noting this crowded reproduction Mr. Davis conceived the idea that the transplanting of such seedlings from their frequently close-crowded position under shade, where they were sure to die out, was entirely practicable, and his experiments in 1904 were sufficient to indicate the exact size of plants, and the methods of transplanting which will give most assured success, and allow the reproduction in the park to be very largely extended.

In 1904 some 800 plants were transplanted, Mr. Davis doing the work unaided. The trial was entirely satisfactory, as very few seedlings died even when set out in unfavorable conditions of soil moisture. The plantation came through a summer exceptionally hot and droughty, even at the elevation—about 6,000 to 7,000 feet, of the park, and though the watering of the transplants, carried on into midsummer,

had then to be abandoned because of failing water supply.

The available supply of plants, of the size which the past experience showed to be the most desirable, was short for the spring of 1905, and only 600 more seedlings were set out, though the transplanting is to be continued and extended, and a large supply of forest-grown stock should be of suitable size and maturity the spring of 1906. For the future further supplies of naturally sown stock is also being provided for by the burning off of the surplus litter in several places in the park to catch the fall of seed from good seed years such as occurred the fall of 1904.

In the 1904 planting seedlings of a size between 1 and 18 inches high were dug up carefully to avoid injury to the long taproot system, were carried in pails in a puddle to the planting sites—generally the small fire-opened spots in the forest, and set out in deep, watered holes, the whole root system being carefully spread out, and the hole filled in with fine earth. They were set out at the rate of about 100 a day.

Planting two seedlings together was at first tried, but as both seedlings always lived the practice was discontinued. No deaths resulted from a severe freeze, which occurred in April immediately following the transplanting when the soil was bare of snow. Some trouble was experienced with ground squirrels, which occasionally dug up the transplants, but they were readily poisoned off.

The transplants came successfully through the summer, in spite of the cessation of the watering at the time of greatest need, and nearly all the seedlings were thrifty when measured in the latter fall of the year. As might be inferred from the very successful sapling growth of the species in open cut-over lands, from which bigtrees have been lumbered, the best of the transplanted growth occurred where there was most abundant light. Plants of 6 to 10 inches height grew from 5

to 8 inches in the season. Most of the plants set out were from 4 to 18 inches in size—that is 2 to 3 years old. These have taproots often 1 to 2 or more feet long, and they are therefore transplanted with some difficulty, and if with proper care at some expense of time. However, some plants 1 to 4 inches high, or 1-year-old, were set out, which did not succeed so well. Most of the 10 per cent loss noted at the end of the first season was confined to this size class. It is evident, therefore, that the larger sizes must be used for transplanting, in spite of their less suitable root system, and for succeeding years 4 to 10-inch stock will be employed. Failures were due to the inadequate root system,—not sufficiently developed to reach moisture deeper in the soil, and so to maintain the plant against the summer's drought.

Seedlings are thus seen to be hardy to drought and frost, but are best suited by rich moist soil. Experiment has shown that they may apparently be planted and succeed beyond the natural altitude range of the tree in the existing groves. Young seedlings are also occasionally dug up by ranchers and homesteaders living in the val-

leys in the foothills, during visits made to the bigtree groves. The Sequoia saplings occasionally seen in the door-yards of ranches in the foothills and in yards in the towns through the San Joaquin Valley have generally been thus transplanted successfully from the groves in the mountains. They are here succeeding—making exceptionally thrifty growth, and developing into fine ornamental trees, at altitudes of from 300 or 500 feet up to 2,500 feet.

This experiment in the General Grant Park, and the success that has attended it, points the way for the improvement by the officials in charge of other bigtree groves. The presence of a protected and well distributed reproduction, now lacking in most groves, could be gradually brought about in the Sequoia and Yosemite National Parks by similar transplanting by the members of the ranger service, and much interest for visitors would be added from the visible comparison in the groves of the seedlings and saplings of the bigtrees growing under the broad spreading crowns and massive columns of the mature giants, while the rapid growth of the saplings would later furnish trees of pole size, now only infrequently met with.

SPRUCE SEED SOWN BROADCAST

BY

A. KNECHTEL

Forester, New York State Forest, Fish and Game Commission.

IT is a matter of common observation that evergreen trees spring up readily in poplar groves, and hence a notion has become prevalent that spruce finds in such places good conditions for reproduction, and that spruce forests might be started by scattering the seed under the poplar trees. To put the matter to a test, the Forest, Fish and Game Commission of New York sowed in 1903 about a

bushel of native spruce seed in the poplar groves near Aiden Lair, Essex county, New York. The ground was quite well covered with poplars which ranged in diameter from four to ten inches. There were no small evergreens beneath them, nor were there any large spruce trees nearby from which seed might be shed. Therefore, any spruce trees that have begun to grow there during the past three

years, may be considered as having come from the seed sown.

The seed was scattered on the fallen leaves, on decaying wood, and especially on all spots where the mineral soil was exposed, and these were quite numerous. About eight quarts of seed were put on an acre.

The seed received immediately several showers, but from April 4th to June 11th no rain fell in the Adirondacks.

In July, 1904, an examination of the ground was made. Where mineral soil had been exposed, and on rotten wood, the little trees were doing quite well, in many places four or five trees being found on a square foot. In other places, however, especially where the leaves were thick, they were rather scarce. But over the whole ground they were probably sufficiently numer-

ous to make an evergreen forest if they all continue to grow.

In August of this year the groves were again examined. The little spruces were still alive, and seemed to be about as numerous as they were last year.

It is too early yet to form a judgment as to the ultimate success of the experiment. Moreover, the results from a single experiment, however encouraging, are not sufficient to warrant the conclusion that spruce forests can be produced satisfactorily in this way. Repeated experiments are necessary, and with these we shall probably learn that the seed must at least reach the mineral soil.

The evergreens in poplar groves are, as far as my own observations have extended, mostly balsam, a species much less exacting in its requirements for reproduction than the spruce.

DRILLING TO BED ROCK

Description of an Important Class of Work in the Building of Irrigation Enterprises.

ONE of the least understood, but by no means the least important feature involved in the construction of a large irrigation project, is the work of drilling parties making underground investigations to determine the character of the formations upon which dams and other structures are to be erected. While the use of the drill is of the utmost importance in determining the location of dams, it is also essential in ascertaining the character of soil in reservoirs, in tunnel and canal construction, and in sinking wells. Without a knowledge of the depth to bed rock and the nature of the formation, no contractor would bid upon the work. It is not safe to rely upon surface indications, and even an experienced geologist finds himself at fault when endeavoring to predict the character of river bed for-

mations. In each of the great national projects this work is necessarily preliminary to actual construction, and frequently upon the results of the boring rests the feasibility of the project itself.

The drill outfit is of two kinds, one operated by steam power, the other by hand. The latter is used in regions remote from transportation and where fuel is not obtainable. As the reservoir and dam sites are usually located in inaccessible mountain canyons, far from railroads, the hand drill is generally used in connection with reconnaissance surveys and preliminary studies of the project, as it can be packed on the backs of horses and transported over mountain trails or lowered into deep canyons.

The drill consists of a steel bit screwed on the end of a hollow tube.

The drill chops down through the soil and loose material, which are forced upward in the casing by passing a stream of water through the tube. The casing follows the bit as it penetrates downward. On encountering a boulder or other material which retards the passage of the casing, the rod and casing are lifted, a charge of dynamite is set off and the obstacle removed. When rock is met with, a circular bit is used in which are inserted six or eight black diamonds or carbons. The rotary motion of the bit grinds the rock and the core comes up through the bit into the barrel to which the latter is fastened. On the bottom of the barrel just above the bit is what is called the core shell, with a split ring in it, both shell and ring being cone shaped. On pulling out the bit the ring slips down and closes, thus preventing the core from falling out.

Samples of earth are kept in four ounce bottles, the same dimensions as the diameter of core, and all are placed in trays properly labeled for the inspection of contractors bidding on the work. Each boring shows a complete section of the bottom. With this process one man made thirty-two moves of machine and put in 1,160 feet of boring in six days. The cost of the work varies from 10 cents to \$5 per foot, depending on the locality and character of material.

Notable instances of the unreliability of surface indications are numerous. A few of these may be mentioned as of particular interest in indicating how little dependence may be placed upon surface showings in river canyons.

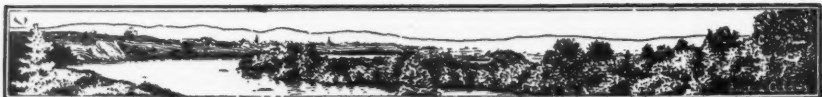
In the Shoshone canyon, Wyoming, the river has cut a narrow passage with walls a thousand feet high, through a mountain of granite. Surface indications were that the river passed over bed rock and that no trouble would be experienced in fixing a

monster dam immovably upon the solidest sort of a foundation. But the drill quickly dissipated this hope. It took all winter to find bed rock, and it was only after a number of moves up and down stream that a suitable location was found. Here bed rock was found at 65 feet, after passing through boulders 30 feet in diameter on top of beds of gravel. At the point first selected for a site, bed rock was found at a depth of 88 feet, and borings were continued to a much greater depth to make sure that a solid foundation had at last been reached. At the Pathfinder dam site in Wyoming, where the surface conditions were practically identical, bed rock was found at a depth of 5 feet.

On the Colorado River between Yuma and the mouth of the Grand Canyon, the government expended \$40,000 on drilling and then failed to find a permanent base for a dam. At the Laguna dam site, near Yuma, the river passes between granite walls, and in the channel rocky ledges extrude in several places. The drill showed that these ledges were not connected at the bottom; that between them were great wide pockets of sand 168 feet in depth. This condition necessitated complete change of plans for a structure.

The engineers have completed preliminary borings in the Klamath country, southern Oregon, finding good formation near the surface for a dam site. Borings were made there for a tunnel 110 feet below the surface and 1,500 feet long, which is to take water around and outside the town.

At the Malheur dam site bed rock was found at 28 feet in a first-class location. At Minidoka, Idaho, the river cuts through a lava ridge and permanent foundation was found at 20 feet. Work is now being carried on by drilling parties in North Dakota, Oklahoma, California, Utah, New Mexico, Colorado, Montana, and Oregon.



THE PECOS VALLEY

Immense Development Going on and More
Promised Through Reclamation Projects

BY

A. M. HOVE

PECOS VALLEY, famed in song and story, is meriting fame in material progress as well. On all sides the visitor sees marked evidence of progress and development from Roswell southward far into the Texas part of the valley.

Irrigation in the upper Valley is by artesian wells or canals from tributaries of Pecos River, while in the lower valley the waters of the Pecos itself are used exclusively. Near Lakewood is McMillan reservoir, an artificial lake of large dimensions, supplying water to the fertile lands around Carlsbad, Otis, Loving, and Malaga.

Carlsbad itself is a beauty spot. Its convenience of location, its banking and trading facilities, its exceptionally good schools, its fine water and excellent supply of corn, alfalfa and other feedstuffs have attracted the stockmen from far and near. They live in Carlsbad and run their stuff, may be, a hundred miles away on the plains.

The superb climate, both summer and winter, the moderate elevation, 3100 feet, and good hotel accommodations make Carlsbad the Mecca of the health seeker and the pleasure seeker.

Carlsbad has risen to the occasion and the remarkable progress of the past year is proof thereof. Substantial business blocks and fine residences have gone up. Streets have been graded; sidewalks, as broad and smooth as any city can boast of, have gone in. Carlsbad is no longer a

jumping off place just beyond nowhere. It is modern, metropolitan.

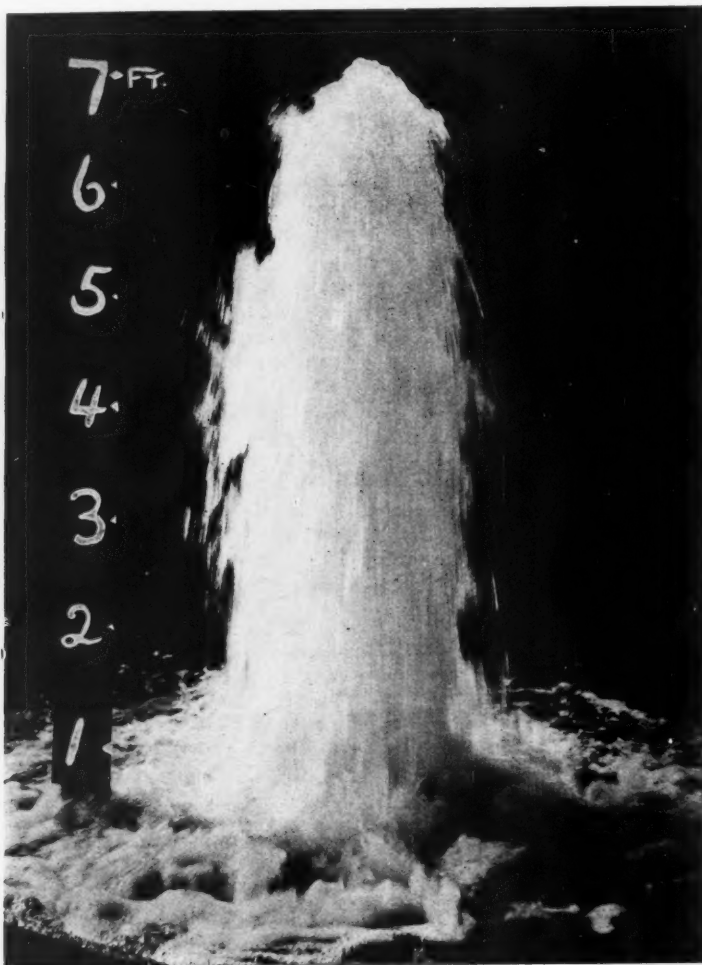
The farming section extends for many miles below Carlsbad. The soil is fertile. It responds to modern methods of cultivation like few soils. Strong in the elements necessary for plant food, all it needs is the directing hand of intelligent man to produce bounteous harvest of alfalfa, corn, fruit—anything that fancy may like to plant suitable to the climate.

This part of the valley is at present receiving more than its share of attention from men who look into conditions to determine what the future may be. The Reclamation Service has had a corps of engineers in the field since last December looking into the possibilities of a better and larger irrigation system under government control. B. M. Hall, Supervising Engineer of New Mexico, Oklahoma, and West Texas, with headquarters at Carlsbad, is directing the investigations. Thomas Means, soils expert, has gone over the lands and determined the acreage of land suitable for irrigation. H. A. Storrs, electrical engineer, has made an estimate of the probable amount of power that may be developed at the various dams. J. M. Giles, district hydrographer of the Geological Survey for New Mexico, Oklahoma, and West Texas, also has his headquarters in Carlsbad. Besides his regular assistant hydrographers other men connected with the hydrographic work like C. E. Murphy, Hydrographic Inspector, and M. O. Leighton, Engineer Hydro-Economic

Investigations, have also spent some time on the Pecos and more especially on the Carlsbad project.

The farmers have organized Water Users' Association to deal with the

have followed developments have come and bought lands so as to be on to go further and bring thousands of acres of desert under cultivation that private capital could not master.



View of the Largest Artesian Well in the Pecos Valley, near Artesia, New Mexico.
It flows over 3,000 gallons a minute

government in case the present investigations of the irrigation system of the Pecos Irrigation Co. and possible extensions result favorably. Everything so far looks promising, and men who

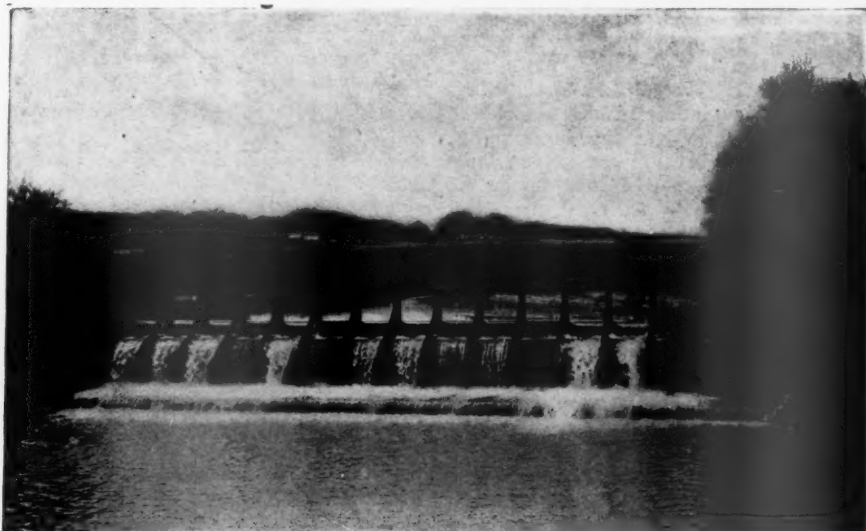
Two power dams are also under construction, one at Carlsbad and the other six miles south of Carlsbad. Both concerns will develop power for light and other purposes. It is prob-

able that electric power will come into use on the farms instead of gasoline and steam engines.

On the whole the lower valley is a the ground in time for the possible change.

Private capital has done much to

develop irrigation in this valley. But the Reclamation Service will be able good place to live. The farming district has free rural delivery, telephone system, railway stations near at hand—in short, all the conveniences that older communities claim.



Head of the Canal of the Felix Irrigation Company, in the Pecos River Valley, near Roswell

FORESTRY IN THE PUBLIC SCHOOLS

Suggestion As to a Way to Interest Children
in the Practical Side of Forest Growth

BY

A. NEILSON

SOME instruction in forestry, I believe, would be of great benefit to the children in our public schools, without working any great hardship on the teachers. I am painfully aware that a lot of hands will be raised in holy horror at the idea of introducing a new study, and I would not wonder at it, for in the present day, *real* work-

ers are, as a rule, overworked. But I think it very important to teach children something about nature in a practical way—and, in my opinion, the best thing to do is to teach them something about practical forestry.

The average child in the country grows up with the impression that country and nature simply mean dust,

mud, and crops. The dust and mud on the walks to the school house, the crops after he gets home, or during his holidays, when his father has to be helped out. When I was a small boy, and walked to school in Harford county, Maryland, about all I knew about nature was that it produced sassafras roots, and I used to dig them out of the roadside. I never was taught anything about botany, and often sat in the school room looking out of the window at all kinds of tree growth, without having the slightest idea of what it all meant. Even while I was quite small, I took up nature study, on my own account, because I had a natural inclination for that sort of thing, and I have kept at it ever since, and now, when walking or driving the country, every kind of growth presents some matter of interest to me. But I sincerely regret that I was taught nothing of nature at the various schools I went to, for what one learns at school, even in a primitive way, holds on through life, to a certain extent. Studies that I hated and shunned in every way, have still left their imprint, and even the limited knowledge I got of these distasteful ones has been in after life of great use to me. It will be the same with the study of forestry. Some children will be enthusiastic over it, some will dislike it, but it will leave its imprint on all. When a child grows up and has occasion to plant trees, he or she will remember their early teaching, and not be absolutely in the hands of a nurseryman. Some teachers will not appreciate or like this new study, but they must be teaching things now that they do not like nor have any interest in. To the new study I advocate I offer the solace of *outdoor work*. It takes the teacher and the children from the bad atmosphere of the school room into the clear, pure atmosphere of outdoors, where it will be simply play while the studies are going on. I trust this argument will do away with the usual objections offered to the introduction of a new study. I

am simply suggesting a little more sunshine for the otherwise dull life of the school room.

The country child is fairly engulfed in everything that is attractive, yet he has no conception of it. The city child is taught a great deal about the country, and he is thoroughly posted as to his city life, too; but he will do any amount of work in anticipation of a day in the country, and when he gets there, will often be able to tell his country cousin all sorts of things about the trees, shrubs and flowers, that will make the latter open his eyes.

The country child, unfortunately, does not know either his own life, or the city life—he little dreams of the pleasures that are lurking for him in the woods, fence rows, and fields. Help him, give him some little instruction as to the ways of nature and he will be happy and go on and learn the rest in his own way.

I do not expect teachers to become expert foresters, nor is there any occasion for going very deep into the matter. What I suggest is simply a practical start in a small way in forest education. The salient and simplest forms of forestry must be taught out of doors, among the trees and bushes. What I advocate at the start is to teach the children how to distinguish the various trees and shrubs, teach them their habits, growth, etc., purpose for which the wood is used, and the families the different trees belong to; teach them how to dig up a tree and how to replant it, and how to raise it; how to plant nuts and raise trees from them. This is what I would suggest as a beginning. Really, the starting of an "Infant Class" in forestry.

My idea is, that each school shall have a small nursery, say one-fourth of an acre or even less. This is to be fenced in. Nearly all the school lots adjoin some farm, and it is entirely probable that the owner of the farm would lend this much land to the school commissioners, who could fence it in at a cost of say, \$5. And no

doubt the farmer would contribute the plowing and preparing the ground so that the children could take hold of it and grow the trees. Each school would be furnished with a shovel, hoe, and iron rake. There is, as a rule, in every country school a few boys big enough to wield a shovel; these boys would do the heavy work.

I would suggest giving two to four hours a week to forestry work, the teacher selecting fit days. In the spring, from the middle of March to the middle of May, would be the planting time, and in the fall, October and November. During these periods the teacher would take the children to the nearest woods and dig up seedling trees and shrubs, and in the fall collect the nuts for planting. The trees the teacher would get would be the smallest seedlings, as small as six inches high. These would be planted in the nursery, and during the other months, when fit, the children could be set at work in the nursery caring for it. The nursery will take care of itself during the holidays and during the off planting season. The teacher would also take the children to the woods and give them little lectures on tree matters.

The teacher would not have to be an expert to do all this. I propose that each teacher be given a "tree book," for there are several very good ones to be had, that explain very fully to beginners in arboriculture. There should be purchased by the school commissioners a few dollars worth of very young seedlings from some nursery, so that the instruction will not be confined entirely to native local trees.

A large number of trees can be grown on a nursery of one-fourth of an acre, and giving three years as the age of removal from the nursery, the plantings should not be more than a third of the nursery area each year. When the trees, at the end of three years, must be taken up, they can be given to the parents of the children, or can be sold. If sold, the money

would go to the school to establish a library or for other useful purposes.

I think in a short time after the study is taken up, there will be quite a rivalry among the schools, over their nurseries.

I do not know how much time can be spared from the regular school studies for the forestry matter. A long time on one day would be better than a short time on several days, and the day must be selected each time by the teacher.

If the expense of fixing the fence around the nurseries, getting the tools, books, etc., is more than the commissioners can stand for all the schools, I would suggest the selection of some schools, best situated for the purpose, and in this selection of schools it would probably be best to take them where the teachers rather like this kind of study; then these schools would be an example for the others, and in course of time this study would be taken up by all.

I estimate that the money required for the introduction of the study of forestry for each school the first year would be about \$17.25, made up as follows:

Fencing in the nursery....	\$5.00
Purchase of outside trees..	8.00
Two books.....	2.00
Pamphlet marking directions	.25
Tools	2.00

\$17.25

With this capital invested, there would be no more expense, except the purchase each year of say, about \$5 worth of outside trees. No sales can be made from the nursery for about three years, but after that, each year will produce its crop of several hundred trees, and they would be sure to produce an income of \$25.00 per year or more.

While the instruction in forestry is going on, a lot of wild flower study will naturally come in, and will not interfere.

WATER POWERS OF WISCONSIN

AN investigation of the stream flow and power possibilities of the State of Wisconsin has been in progress by the Hydrographic Branch of the Geological Survey for several years. Prof. L. S. Smith, of the University of Wisconsin, also has been making a study of this subject and recently prepared a report which is to be published by the U. S. Geological Survey in the form of a Water Supply and Irrigation paper. This paper will be full of facts concerning the water power resources of Wisconsin which will be of great benefit to the public in general as well as the people of Wisconsin.

The conditions for the creation of water power on the streams draining northern Wisconsin are among the best in the United States. In the northern-central part of the state there is a high plateau consisting of hard crystalline Pre-Cambrian rocks. This elevation is covered with a layer of drift deeply pitted by glacial action, which has resulted in the formation of numerous lakes throughout the entire region. These lakes form natural and extensive storage reservoirs for the rivers flowing from this plateau. The height of this land surface above all of the surrounding country results in a considerable excess of precipitation over its area, the actual rainfall here being several inches more than that of the surrounding country.

This region has an almost complete forest covering which adds greatly to the conservation of its water supply. Completely surrounding this Pre-Cambrian region is one of Paleozoic origin consisting to a large degree of soft Potsdam sandstone. Owing to the altitude of deposition and the poor weathering qualities of these paleozoic rocks, the country surrounding this plateau is considerable lower. Consequently the rivers that rise in this Pre-Cambrian district must necessarily pass from a high altitude to a low one,

and in so doing have cut their channels through the glacial drift down to the crystalline rocks.

In making this descent many rapids and vertical falls are produced, and throughout almost the entire course in making this passage from one character of geological formation to the other, excellent sites for dams abound. The most important rivers in the state of Wisconsin rise in this high region, either by actual source or by tributary. The Menominee, the Fox, the Wisconsin, the Chippewa and the St. Croix all drain waters from this region.

Menominee River, which forms the boundary line between Wisconsin and the upper peninsula of Michigan, is supplied by waters in the lakes from the Pre-Cambrian district of Wisconsin and the northern peninsula of Michigan, and passes in its course down from high altitudes to lower ones, and eventually into Green Bay. From the origin of this river at the junction of Brule and Michigamme Rivers to its mouth, a distance of about 104 miles, the river falls nearly 700 feet. This fall is concentrated into 15 rapids, any one of which is worthy of power development. These falls vary from 5 to 62 feet, the average of which is about 28 feet. At all of these locations there are reasonably good situations for dams. Of the 15 rapids 10 are still undeveloped.

In Wisconsin River between Ne-koosa and Rhinelander, a distance of 146 miles, there is said to be a fall of 640 feet, which gives an average fall of 4.43 feet per mile. This fall is concentrated into many rapids and vertical falls, producing a very large number of valuable water powers. Many of these have already been improved and are now the centers of important industries. There are many very valuable locations that have not yet been developed, especially in the upper reaches of the river. Between Ne-

koosa and Rhinelander there are nine excellent water powers with good locations for dam sites that have not yet been developed. The fall of these rapids vary from 20 to 90.5 feet, with an approximate average of 31 feet for the nine.

Black River, between a point near Neillsville and Black River Falls, a distance of about 40 miles, has a total fall of 337 feet, a fall of about 9 feet per mile. This fall is concentrated into rapids where heads from 24 to 85 feet can be developed.

On the Chippewa River, and its main tributary, the Flambeau, are likewise many excellent opportunities for power development. There are 15 well known locations above Eau Claire, none of which have been utilized. These rapids and falls vary in developable heads from 14 to 55 feet, the average for the 15 sites being about 31 feet.

Sufficient information concerning the St. Croix River profile has been acquired to make it certain that it has many very valuable water power sites. The St. Croix Rapids at Taylor's Falls contain 55 feet fall in six miles,

nearly all of which can be economically developed. There are several other well known rapids above this point that will eventually be developed as the surrounding country is better settled.

The mean and minimum discharge of these streams is so large as to insure a reliable water supply at the various rapids mentioned. For the past three years the U. S. Geological Survey has been doing systematic work in the line of gaging of these streams and their tributaries, and a considerable extension of this work will be made this summer.

The many tributaries of these streams abound more copiously in falls and rapids than do their parent rivers. A like condition prevails on the short and less pretentious streams of the Lake Superior drainage. Not only are the lower sites greater in number on these minor streams, but greater in height and fall. While the discharges are comparatively small, they are fairly constant. These conditions offer an excellent and reliable opportunity for investments of small capitalization.

RECENT PUBLICATIONS

Bulletin of the Iowa State College of Agriculture and the Mechanic Arts. Compendium Number, December, 1904. Vol. III—No. 1. Ames, Iowa, 1904. Pp. 80.

Of a high typographical standard, and with numerous excellent half-tone illustrations and interesting reading matter, this Bulletin of the Iowa State College of Agriculture and the Mechanic Arts certainly should serve to attract students, and further than a mere catalogue of the school, presents in an attractive manner the diversified charms of campus, dormitory, lecture room, foundry, machine shop, and college activities.

Johnson's Guide to the Government Land of the United States. Wm. H. Johnson publisher, Springfield Mo. Pp. 152, illustrated. 1905.

This volume was published with an idea of giving the best possible information concerning the public lands—where entries may be made, character of land, how to make entries, and with synopses of homestead,

desert, timber, mining and irrigation laws. The book has two grand divisions: First, "The Land," in which is described by states, all land open to entry; and, second, "The Law," in which all legislation, national or state, is discussed, also by states. To the homeseeker the volume should prove a boon, and the information given is substantially correct. Numerous half-tone illustrations embellish the book and amplify upon the reading matter.

Arid Farming in Utah. First Report of the State Experimental Arid Farms. Bulletin No. 91, Experiment Station of the Agricultural College of Utah. Pp. 113, illustrated. Logan, Utah, January, 1905.

Discussion of the subject matter in this bulletin is grouped under the general heads of general introduction; reasons for believing arid farming feasible; results already secured; work yet to be done, and principles of arid farming. There are nearly 45,000,000 acres of arid lands in Utah, and the Bulletin

discusses in a way interesting and intelligible to all, the best methods of reclaiming the land, and of the principles of arid farming.

First Biennial Report of the State Engineer of North Dakota. By E. F. CHANDLER. Pp. 91, illustrated. Tribune Press, Bismarck, 1904.

Some valuable information for irrigation farmers and water users generally is contained in this first biennial report of the State Engineer of North Dakota. The article on stream measurement and run-off of streams in North Dakota is especially interesting, and the description of the different apparatus used clear and lucid.

Forest Utilization. By Dr. C. A. Schenck. Pp. 118. Biltmore Forest School.

The matter contained in this pamphlet was prepared primarily for the students of the Biltmore Forest School, and is designed as an outline for study of this subject. There is no direct reading matter, except where such is necessary to make more clear some particular topic, and the whole is an outline subdivided again and again, down to the most insignificant process of utilization of wood or manufacture of by-products. That which is especially commendatory in the book is the fact that it presents in a lucid and concise manner the degree of relationship which all operations bear to each other, and their dependency upon certain conditions and the effect of certain causes.

Report of the Examination of a Forest Tract in Western North Carolina. Bulletin No. 60, Bureau of Forestry. By Franklin W. Reed. Pp. 29, illustrated. Washington, Government Printing office, 1905.

This one of the series of Bulletins issued by the Bureau of Forestry, which, while treating of a particular locality, is interesting to the public at large as affording an insight into the working methods of the Bureau, and giving them an opportunity of taking advantage, in whole or in part, of certain of the recommendations. The region described is an area of about 16,000 acres, in the counties of Mitchell, Caldwell, and Watuga, of which about 93 per cent. is still in practically virgin forest.

Report of the Superintendent of Forestry, Department of the Interior, Dominion of Canada. Pp. 28, illustrated. Ottawa, Government Printing Office, 1905.

A steadily increasing interest and appreciation of forestry by the people of Canada and a recognition of its value as a national asset, have done much to aid Mr. E. Stewart, Superintendent of Forestry, and make possible the splendid progress achieved in this branch of the service. An interesting

paragraph in the report deals with the co-operation extended by the government to prairie settlers in the planting of forest trees. In 1904 the total number of applicants for trees furnished by the government was 2,218, as against 1,649 in 1903, and the total number of trees distributed 1,800,000, as against 917,950 in 1903. The figures given show eloquently the acceptance by the settlers of the value and importance of trees.

Range Management in the State of Washington. Bulletin No. 15, Bureau of Plant Industry, Department of Agriculture. By J. S. Cotton. Pp. 26, illustrated. Washington, Government Printing Office, 1905.

This bulletin is a valuable contribution to our knowledge of improvement of range lands, and the study of the question was the result of a coöperative arrangement entered into between the Department of Agriculture and the Agricultural Experiment Station of Washington in the spring of 1901. This coöperative arrangement was concluded in December, 1903, and again taken up by the Department of Agriculture alone in June, 1904, and carried on since that date. The management of the range in a practical manner, calculated to make it serve all needs best and yet remain permanent, is a very serious problem in grazing sections, and this bulletin is therefore particularly appropriate at this time, when appreciation of this fact is gaining ground.

Indian Forester for February, 1905. Mr. E. P. Stebbins, editor. Pp. 60-117, illustrated. Allahabad, India, The Pioneer Press, 1905.

In January, 1905, the *Indian Forester* commenced its thirty-first volume with many improvements and additions. The size of the magazine has been made larger, it is printed on better paper than heretofore, and although it will be hard for the management to improve on the excellent reading matter which has always heretofore appeared in its pages, they have made its appearance more inviting by numerous illustrative in character, prints the governmental transactions. The *Indian Forester* is semi-official in character, prints the governmental assignments of foresters, reports and matter of interest generally and this governmental association makes its readers confident of receiving authentic and authoritative information. The magazine, while devoting space to the discussion of professional problems which confront the Forest Service in India, also endeavors to lay before its readers both sides of questions when forestry comes into apparent antagonism with agriculture and the daily wants, habits and customs of the people, with irrigation projects, and in fact with the thousand and one difficulties which face officials of all classes in the performance of their work in the country.

DEPARTMENT OF THE INTERIOR, United States Geological Survey, Reclamation Service, Washington, D. C., August 2, 1905. Sealed proposals will be received at the office of the United States Reclamation Service, Montrose, Colo., until 3 o'clock p. m., September 26, 1905, for the completion of the Gunnison Tunnel, involving 27,500 linear feet, more or less, of tunnel, the same being a portion of a system for the diversion of about 1,300 cubic feet of water per second from Gunnison River to the Uncompaghe Valley, Colo. Specifications, form of proposal, and plans may be obtained from the Chief Engineer of the Reclamation Service, U. S. Geological Survey, Washington, D. C., or from the Engineer of the Reclamation Service, Montrose, Colo.

THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, United States Geological Survey, Reclamation Service, Washington, D. C., August 22, 1905. Sealed proposals will be received at the office of the United States Reclamation Service, Roswell, N. M., until 2 o'clock p. m., October 17, 1905, for the construction and completion of earth embankments, involving about 200,000 cubic yards of earthwork and 150,000 cubic yards of overhaul, at a point about 12 miles southwest of Roswell, New Mexico. Plans, specifications and forms of proposal may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to W. M. Reed, Roswell, New Mexico.

THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, UNITED STATES GEOLOGICAL SURVEY, RECLAMATION SERVICE, Washington, D. C., September 1, 1905. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, 1108 Braly Building, Los Angeles, California, until 10 o'clock a. m., September 30, 1905, for furnishing from 30,000 to 40,000 barrels of Portland cement. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, United States Geological Survey, Washington, D. C., or to J. B. Lippincott, Supervising Engineer, 1108 Braly Building, Los Angeles, Cal., or to Homer Hamlin, Engineer, Yuma, Arizona. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, UNITED STATES GEOLOGICAL SURVEY, RECLAMATION SERVICE, Washington, D. C., September 7, 1905. Sealed proposals will be received at the office of the United States Reclamation Service, Billings, Montana, until 2 o'clock p. m., December 5, 1905, for the construction of the Lower Yellowstone Dam, a rock filled timber cribbed structure, requiring about one-half million feet of lumber, 700 piles, 1,600 sheet piles, 11,000 cubic yards of rock filling and riprap, and 100 tons of steel, located about 18 miles northeast of Glendive, Montana. Plans, specifications and proposal blanks may be obtained from the Chief Engineer, United States Reclamation Service, Washington, D. C., or from Frank E. Weymouth, Engineer, Glendive, Montana.

THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., September 16, 1905. Sealed proposals will be received at the office of the Electrical Engineer, United States Reclamation Service, 396 Pacific Electrical Building, Los Angeles, California, until 2 o'clock p. m., November 2, 1905, for furnishing complete, f. o. b. bidder's works, one or more 1,260-horse power water wheels and one or more 140-horse power water wheels, with gate valves, pipe connections, and governors, for use in Roosevelt power house, Salt River Project, Arizona. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to O. H. Ensign, Electrical Engineer, 398 Pacific Electrical Building, Los Angeles, Cal. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, UNITED STATES GEOLOGICAL SURVEY, RECLAMATION SERVICE, Washington, D. C., August 26, 1905. Sealed proposals will be received at the office of the Engineer, United States Reclamation Service, Billings, Mont., until 10 o'clock a. m., September 26, 1905, for furnishing 25,000 barrels more or less, of Portland cement, f. o. b. cars at works of the bidder. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, United States Geological Survey, Washington, D. C., or to Jeremiah Ahern, Engineer, Cody, Wyo.

THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, UNITED STATES GEOLOGICAL SURVEY, RECLAMATION SERVICE, Washington, D. C., August 30, 1905. Sealed proposals will be received at the office of the United States Reclamation Service, Belle Fourche, South Dakota, until 4 o'clock p. m., October 26, 1905, for the construction of an earthen dam and appurtenances, and 17½ miles of canals, involving about 2,600,000 cubic yards of earthwork, 3,000 cubic yards of rock excavation, 24,000 cubic yards of concrete masonry and 45,000 pounds of steel and cast iron. The work is located about 12 miles northeasterly from Belle Fourche, South Dakota. Specifications and forms of proposal may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or from R. F. Walter, District Engineer, Belle Fourche, South Dakota. Plans may be inspected at the office of the Chief Engineer of the Reclamation Service, Washington, D. C., or at the offices of the Reclamation Service, Chamber of Commerce Building, Denver Colorado, and Belle Fourche, So. Dak.

THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., September 9, 1905. Sealed proposals will be received at the office of the Electrical Engineer, United States Reclamation Service, 396 Pacific Electrical Building, Los Angeles, California, until 2 o'clock p. m., November 1, 1905, for furnishing complete, f. o. b. bidder's works, one or more alternating-current, 900-kilowatt, 25 cycle generators, one or more 100-kilowatt direct-current generators for exciter, and one switchboard containing one panel for generator and one panel for exciter, for use in the Roosevelt power house, Salt River Project, Arizona. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to O. H. Ensign, Electrical Engineer, 398 Pacific Electrical Building, Los Angeles, Cal.

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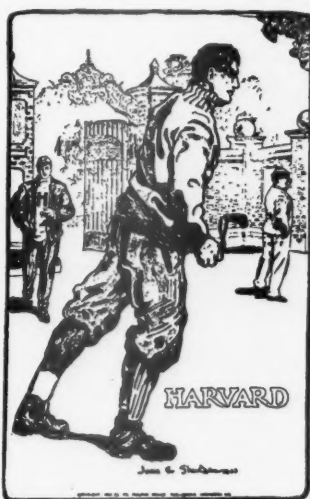
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